The Emergence and Management of an Inter-Organizationally Networked IS Development Industry

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An Exploratory Case Study

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1 Introduction

1.1 Problem Statement

Without doubt, information and knowledge have to be considered core aspects of any modern society in the world (Powell and Snellman, 2004). Today, a substantial part of the population belongs to what has been labeled as the *creative class*. According to Florida (2004, p. 123) this class consists of "scientists, engineers, architects, designers, educators, artists, musicians, and entertainers, (...) the creative professions of business and finance, law, health care, and related fields, in which knowledge workers engage in complex problem solving." During their work, members of this creative class create new ideas, new technologies, or new contents, which consist to a large extent of new information and new knowledge. Obviously, this large pool of information has to be administered and made accessible in some way. In an organizational setting this is commonly achieved through information systems (IS), which are intended to provide useful information either to the members of the organization, or to its clients. Ideally this information is used by the organization to be more efficient, more effective, or both. As computers have become more widely used in organizations, these have mainly been used to automate IS. So, while IS do not necessarily entail technology (Ward and Peppard, 2002), many of today's IS are actually computer-based. These computer-based systems promise (for specific tasks) to be superior to manual IS because ideally a "computer can process data (the basic facts) speedily and accurately, and provide information when and where required, which is complete and at the correct level of detail, so that it is useful for some purpose" (Avison and Fitzgerald, 2003, p. 4).

While the intention behind these computer-based enterprise IS is simply the provision of useful information, their form is highly diverse and furthermore continuously undergoing profound changes. During the early years of organizational IS, software has been largely used for data-intense, repetitive functions such as payroll or accounting (Heinzl, 1996). However, it quickly became obvious that IS can be put to productive use in other areas, too. Accordingly, during the 1970s hundreds of specific solutions emerged that have either been specialized in certain industries or in certain business functions (Campbell-Kelly, 2003). The use of IS in an organizational setting has become wide spread during this time. In the 1980s the perception of IS as purely supporting other (core) business functions changed, and the important role that a well-structured and well-planned application of these systems can play for the strategy of an organization has become evident (Porter and Millar, 1985). However, what exactly constitutes a well-structured and well-planned application of these systems has been, and to a large extend still is, highly elusive. The difficulty to relate the volume of pure technology

investments to an increased organizational performance has been widely recognized as *IT productivity paradox* (Brynjolfsson, 1993; Dedrick et al., 2003). One of the underlying reasons for this fact can be found in the enormous complexity of these systems. As most of the highly specialized solutions of the 1970s have been developed by different organizations independently from each other, the *integration* of these systems became an effort almost as complex as the systems themselves (Mertens, 2005)[1]. Therefore, during the 1980s the trend to integrate various functionalities within one system emerged. This trend manifested especially in the emergence of Enterprise Resource Planning (ERP) systems and in a consolidation of the IS development industry (Campbell-Kelly, 2003). The first development is especially important for this work, since ERP systems promise to achieve exactly the demanded integration of business functions within one system:

> Enterprise systems appear to be a dream come true. These commercial software packages promise the seamless integration of all the information flowing through a company - financial and accounting information, human resource information, supply chain information, customer information. For managers who have struggled, at great expense and with great frustration, with incompatible information systems and inconsistent operating practices, the promise of an off-the-shelf solution to the problem of business integration is enticing. It comes as no surprise, then, that companies have been beating paths to the doors of enterprise-system developers (Davenport, 1998, p. 121).

These integrated systems are commonly assumed to have four main advantages. Without going into more detail, it has been argued that they offer an advanced quality and efficiency of internal business processes; that costs for hardware, software, and IT staff can be substantially reduced; that the ability to access cross-functional information allows managers to make better decisions quicker; and that these systems break down departmental borders and thus achieve the goal of an integrated enterprise (O'Brien and Marakas, 2006). Evidently, these advantages made ERP systems a huge success and the organizations that develop the systems therefore also have been highly successful. A direct result of this is the above mentioned consolidation in the IS industry. Only a couple of large organizations have the resources to develop these large and complex systems, and therefore IS development "remains in the hands of a few 'global players'" (Dreiling et al., 2005, p. 2). This perception is reinforced by the so-far prevalent advice that organizations should focus on the system(s) of one single vendor, and should avoid mixing and matching systems developed by different vendors (Mertens, 2005). Furthermore, customers of these systems have even been advised, in case that they necessarily have to tamper with the system at all, to rather keep their modifications within the standard, predefined configuration options (Brehm et al., 2000) - otherwise severe adverse consequences for the whole organization might be the result as both the system and the organization develop further (e.g. Stedman, 2000).

[1] This book fits well into the here described timeframe, as it has been first published in 1969. It is now in it's 15th (!) edition.

However, during recent years a profound change has happened in the enterprise IS development industry. Whereas the dominant paradigm of the 1990s and early 2000s has been briefly sketched above, recently the large vendors of these systems started to promote their systems with the ability to integrate third party solutions (Greenbaum, 2003). This argument runs counter to the so-far discussion of integration between different vendors' systems as one of the key challenges that organizations adopting an enterprise IS are facing (Bingi et al., 1999). From a practical perspective, this development is clearly observable in the industry, yet it is still largely neglected in the field of IS research. A higher degree of inter-organizational division of labor in the process of IS development has been repeatedly demanded at least since the NATO conference on software engineering held in 1968 (see especially the essay of McIlroy, 1969). However, so far there has been no theoretically well-founded treatment of this topic - current work is either highly technical or purely anecdotal (e.g. Van de Ven, 2005). This is neglecting the enormous impact that the modularization of products has on organizational structures, a phenomenon well documented in other industries (e.g. Baldwin and Clark, 2000). For this reason, recently the demand emerged to analyze the IS development industry, especially its inter-organizational structure, from an organizational or managerial perspective, rather than from a purely technical one (Currie and Parikh, 2006).

1.2 Research Objectives

The overarching research objective of this work is therefore to address the change in industry structure that is currently happening in the IS development field. There are multiple ways how such an endeavor can be approached. The obvious way would be to analyze the industry itself from a macro-level perspective. However, while this way has been approached (e.g. in Arndt and Dibbern, 2006b), it has been decided for this study to not follow it any further. Rather, it is argued that the best way to analyze the industry is through analyzing the organizations of which the industry consists. This promises to yield significant results not only for the theoretical understanding of the industry, but furthermore to assist practitioners in the field in their daily operations. Thus, while the overarching goal is to contribute to a better understanding of the industry, the way this goal is aimed at is through the analysis of the different organizations that constitute this industry[2].

[2] As the discussion in Section 2.1.2.3 shows, organizational structure and industry structure are indeed moving towards each other. The main reason for this is given in the fact that organizational structures of the post-industrialized age are no longer confined within a single organization. Rather, these organizations are only part of an industry network, which offers integrated products or services (Miles et al., 2005; Laubacher et al., 2003). Thus, whenever *organizational* structure is discussed in this work, the term refers to the structure of different organizations within such an industry network. A further elaboration on the potential change perspectives from an industry and an organizational level and a brief rationale for choosing one and not the other is given in Section 2.1.3.

In order to achieve this goal, first a discussion of fundamental factors has to be conducted. This entails an establishing of a clear understanding of the IS industry. This is especially important here, as an inter-organizational division of labor has been demanded for so long and has not materialized in this context (McIlroy, 1969; Glass, 1998). Therefore, it seems reasonable to assume that IS development is subject to specific idiosyncrasies that have so far prevented the emergence of sophisticated inter-organizational structures. Among these idiosyncrasies are especially the facts that IS can be considered an *information* as well as an *intellectual* good. What exactly this means for the industry is discussed as a preliminary step towards an attempt to answer the above described broad research objective. Parallel to these IS idiosyncrasies, details on the current development in industry structure are discussed. Based on concepts taken from general systems theory (von Bertalanffy, 1950; Simon, 1962), a reflection on the development processes of modular products in various other industries[3] is conducted (Galvin and Morkel, 2001; Baldwin and Clark, 2000). As part of this preparatory discussion it becomes obvious that the partner networks[4] in various industries generally evolve around large, well established organizations. As this structure seems to well correspond with that found in the IS development industry (Farhoomand, 2006), the distinction between these two types of organizations is also used throughout the present study.

In this general context, this study can be broken down into three fundamental research objectives. The first issue that has to be clarified is answering the question of *why organizations developing enterprise IS are adopting this cooperative growth strategy.* Considering the above mentioned differentiation between the two types of organizations, the first research question can be broken down further into two parts. First, it has to be answered why the existing, large IS vendors abandon their strategy of exclusive organic growth through adding more functionality to their systems, and instead adopt one of growing through integration of third-party solutions. Second, the question of why complementers attach their solution(s) to the large vendors has to be answered. Thus, the first broad category of research objectives entails the establishing of a clear understanding about the goals that both the large vendors and the smaller complementers have for participating in such an inter-organizational network. Again following the idea of a reference discipline, the literature on strategic networks in other industries is discussed in order to gain this understanding. This literature review supports the perception that accessing *resources* is a key driver in establishing such networks (Hagedoorn, 1993). Thus, a detailed discussion of the resource-based view (RBV) as the underlying theory of most of the works in this area is conducted (Dierickx and Cool, 1989; Wernerfelt, 1984; Barney, 1991). From this theoretical discussion, a set of strategic resources is de-

[3] Such a reliance on reference disciplines has been common in IS research. However, it has also been noted that such a reference discipline should only be used to guide the research and that ideas transferred should always be critically tested before they are applied in the IS context (Keen, 1980). Thus, also the discussion of idiosyncrasies of the IS development industry.

[4] See Section 2.1.2.3 for a more detailed discussion on and a clear definition for inter-organizational networks.

rived that are deemed most relevant for justifying the participants' decision to cooperate through such networks. Each of these resource categories is then further discussed with regard to the two organizational roles in the network. The result of this discussion are *propositions* on why organizations adopt the cooperative growth strategy.

Analyzing this first research objective promises to be relevant for both theory and practice. From a theoretical perspective, a deeper understanding of the idiosyncrasies of IS development at an organizational level are highly relevant. As has be argued above, today there is no clear understanding of the specific effects of these idiosyncrasies, an evident shortcoming of the field. Especially the differences from IS development to other product development disciplines promises to yield significant insights into the inter-organizational IS development process. As the IS development industry is one of the growth motors for industrialized economies (Dedrick et al., 2003; Powell and Snellman, 2004), academic research in this field can be expected to give answers to questions about its fundamental functioning. These answers also promise to be relevant for organizations in this industry. For both the established system vendors and their partners, a clear understanding of why they pursue this strategy is a necessary first step for a successful transition from the monolithic structure of the past to the emerging networked structure. Furthermore, knowing what partners are expected to bring into the network is also imperative for managing the network, which leads over to the second thread of research.

The second research objective is to address the question *how organizations manage the relationships to other network participants*. This approach slightly deviates from the traditional cost-benefit analysis, which then leads to a certain decision concerning the question as to participate in the network or not. Rather than analyzing the decision to participate, this study addresses how to manage the network after the decision to participate has been made. The rationale behind this choice of research objective is to gain a deeper understanding of the presently emerging networks, and how they can be managed in a way that reduces frictions that could potentially offset the above discussed benefits (Eisenhardt and Schoonhoven, 1996). That this threat is very substantial has been well covered in the literature, in which for example Gulati et al. (2000, p. 203) discuss the fact that "networks also have a potential dark side and may lock firms into unproductive relationships." Thus, the deliberate management of the network once it has been established, is a key factor to prevent this type of relationship and thus foster the emergence of a more effective and efficient structure in the IS development industry.

Gulati and Singh (1998) analyze this *dark side* further, and argue that the inherent frictions of networks or alliances stem from two sources - issues that are the result of the partners' behavior and issues that are the result of inherent complexities of such an organizationally modular approach. Again, these issues have been theoretically well addressed in other fields. Especially for the first type of issues, the concepts of bounded rationality and opportunistic behavior, as well as theories that build on these are discussed. The second type of issues has also been addressed in theories on organizational inter-dependencies and their coordination. Thus, similar to the preparation of the first research question, a discussion of approaches on how to manage such relationships is

conducted. The result of this theoretical discussion are three mechanisms that promise to play a role in managing the network relationships in a friction-reducing manner. Consequently, these are again cast in propositions on how organizations manage their network relationships.

The result of the second thread of research is thus again relevant for both theory and practice. It can be argued that from both the behavioral and the complexity perspective, the development of an enterprise IS is an endeavor that is very difficult to be realized through an inter-organizational network. From a theoretical viewpoint it is thus interesting to discover how such an inherently complex endeavor can nevertheless be organized through an inter-organizational structure. From a practical viewpoint the issue of managing such a network is also highly relevant. As frictions can be expected to substantially reduce the effectiveness and efficiency of the overall network, reducing them has to be seen as the key activity of managing the network. Identifying various ways and means how this can be achieved is is a valuable contribution of theoretical research to the practical issue of how to manage such a network.

Finally, the last thread of research objectives connects the two preceding ones. As it has been argued, certain partners bring certain resources into the network. As different categories of resources can be identified, it can also be expected that different categories of partners exist. Similarly, different management mechanisms employed in the network have been identified. Linking those two, the final research thread tries to give an answer to the question *whether differences in partner categories exist, whether these are managed through different mechanisms, and whether there is a* fit *between the two.* Answering this question seems especially important for practitioners, who are legitimately trying to realize the full potential of the network they manage. Through giving them an idea of what measures might be appropriate in which context, IS research is accomplishing at least a first step in answering this question. In this regard the here proposed research goes far beyond what has been discussed in the existing literature.

1.3 Research Design

Research design has been defined by Kerlinger and Lee (2000, p. 449) as "the plan and structure of investigation, conceived so as to obtain answers to the research question." It is therefore of prime importance to address the research design that this study follows as early as possible. However, as Kerlinger and Lee (2000) themselves note, this entails significant difficulties, as it is hard to clearly and unambiguously define what the plan and the structure of a research effort are. As a consequence, classifications of research design have blossomed, so that today it is almost impossible to find an unambiguous label for the research design which is followed. At this point in time it suffices to argue that a research design is to the largest extent determined by the research questions that are intended to be answered and by the control that the researcher has over the events

that he[5] is studying (Kerlinger and Lee, 2000; Yin, 2003). As the discussion on the research objectives above has indicated, the two main research questions are *why* the IS development organizations are adopting a networked strategy, and *how* these organizations manage this changed situation. Furthermore, as the objects of investigation are actual organizations and their behavior, control over the events has to be considered minimal. Following the classification of Yin (2003) this indicates that *case study* research promises to be the most appropriate research design for this study[6].

Following the definition of Yin (2003), this research design is characterized by two distinct features. First, the boundaries between the studied phenomenon and its context are not clear. Closely related to this is the second feature that a multitude of both variables of interest and available data covering these variables exist. Both features are clearly given in the above described context of IS development. Obviously various stakeholders and influencing factors are involved in this industry, and it is by no means clear which belong to the studied phenomenon and which are context. Thus, the case study approach indeed seems to be the appropriate research design. Obviously, this research design comes in multiple variations, so that Section 3.2 discusses various dimensions through which the chosen research design can be specified in more detail. Perhaps the most important dimension to discuss is the scope of the case. In the view of Yin (2003) case studies can be classified along the two dimensions of whether the study encompasses one or more cases, and whether there is one or more units of analysis within the cases. As it has been described above, the unit of analysis has been deliberately chosen to be the organizations that act in the IS development industry. Thus, each case is considered to consist of only one unit of analysis, making it a *holistic* case approach[7].

Another critical issue promises to be, first, how many cases should be considered and, second, the choice of case(s). Today, it is common sense in the community that multiple cases should be conducted if possible Patton (2002); Stake (2006); Yin (2003). As no good justification could be found for conducting a single case study, this work follows this advice. Explaining the second issue of what cases should be selected, the structure of the emerging IS development industry is of prime importance. As it has been argued, the IS development networks promise to emerge through the nesting of smaller companies around the existing solutions of leading organizations in this industry. Thus, this research addresses both the leading IS development organizations and the smaller partner around them. The first case is one of the leading companies. This organization

[5] It should be noted that only the male gender is used in this text. It is intended to also represent the female.

[6] This decision is further elaborated on in Section 3.1.

[7] One might argue in this context that also the industry can be considered the case and the organizations the units of analysis, which would make the design that of a single, embedded case. Finding a clear-cut argument for one of the two is difficult. However, as the studied organizations are all interacting in complex, and also very diverse contexts, it is argued that each organization should be treated as its own case, rather than treating the entire industry as the case and the organizations that are embedded in the industry as the units of analysis.

is well established in the global IS markets, it has thousands of customers in more than one hundred countries worldwide and generates multi-billion dollar revenues per year. Based on this starting point multiple other organizations that are part of the first case company's network are analyzed. The second case is also addressing a leading IS development organization. This case company again is achieving multi-billion dollar revenues on a global scale. Thus, both the drivers for participating in the network and how the network is managed in this second case promise to be similar to those of the first case company. Once it has been shown that this case is sufficiently similar to the first case, a range of other cases is addressed that all promise to be different from the first two cases in that they all address partners of Case Company A that are not well established, global IS development firms. In contrast, these partners are all addressing specific niche markets and thus have much smaller revenues with less customers and also much less employees. Thus, these cases promise to be different in both the reasons for participating and the type of management employed in the network.

1.4 Study Organization

After this brief introduction to the topic and the proposed research design, the following chapter develops a conceptual framework on which this work is based. In order to do this, first a discussion of IS development is conducted. This discussion is intended to clarify the context in which this work is set, and to establish a common understanding of the terms that are often used differently in different contexts. Also, modularity of products, organizations, and industries is discussed as a founding pillar of this study. A key argument here is, that both are highly inter-related and that organizational and industry structure is so far a much lesser researched topic in the IS field. Therefore, this study addresses this issue especially with a discussion of organizational networks, which are have been identified as the prevalent structure in the IS development industry. Through which perspective this is done is then discussed in the final section of the fundamental part.

From the discussion on organizational networks, it becomes evident that indeed the two questions on why organizations participate in networks and how these networks are managed are prevalent in the literature. Addressing the first question has been conducted especially through the resource-based view on organizations and its derivatives. Based on this theoretical lens, resource considerations are made that lead to the proposition of why organizations participate in these networks. Similarly, the question how such networks are managed is addressed from a theoretical standpoint first. Based on this discussion again propositions are put forth how such a structure can be managed. These propositions are intended to guide and structure the research approach, a key requirement for qualitative case studies (Eisenhardt, 1989b; Katz, 1953; Yin, 2003).

The third chapter then addresses the research methodology in more detail. As has already been mentioned the proposed design is that of a case study. In this chapter, first this approach is contrasted with other research designs such as experiments or surveys. A continuum of these designs is given and it is argued further why the case approach is appropriate. Subsequently, more details of the approach are discussed. As is already implicit in the research questions, this study is inherently *exploratory*, rather than *confirmatory*. What exactly the differences are and how these influence this study is discussed in Chapter 3. Also discussed is the difference between qualitative and quantitative research, and why the former is chosen for this study. Further, the study follows a *variance* theoretical approach, rather than a *process* one. The final aspect that is addressed in this chapter is the process of data collection in the case companies.

In Chapter 4 the actual case study is conducted. This chapter follows a three-staged approach. On the most basic level, following the metaphor of replication case studies as follow-up experiments, each case is analyzed with disregard of the others. In general these case discussions follow the three proposed research objectives. First, a brief discussion of the case company is conducted. This discussion especially focuses on (historic) developments of the company's network participation. The second part then addresses reasons why the case company joined the network. Then each single case analysis then addresses the question how the network is managed by this company. Especially for the first two cases then an effort is made to integrate these two discussions into an answer for the third research objective. Once all single cases have been analyzed individually, a cross-case analysis is conducted for the large, well established two first case companies as well as for the other companies. The goal of this analysis is to develop ideas of similarities in-between these two types of organizations in the network. Then, the final step is to integrate these two perspectives into a holistic picture of the entire network.

The study closes with a brief summary of the main findings and an outlook into future research. This outlook is sub-divided into two main parts. First, it is discussed how a similarly structured scientific study could proceed from the foundation that has been laid in this work. Second, it is discussed which lessons have been learned that might benefit practitioners, and also which links could be found for studies form other sub-disciplines of IS research.

2 Theoretical Conceptions

It is the goal of this chapter to develop a theoretical framework in order to structure and guide the following empirical research. In order to achieve this goal, the chapter is subdivided into three main sections. The first part develops the foundations necessary for an understanding of the topic of this study. It delimitates its context within the very broad field of IS development (Bacharach, 1989) and further argues why the addressing of the proposed research questions is important (Currie and Parikh, 2006). Based on this discussion, the ideas of general systems theory are introduced. These are subsequently applied first to product development, then to organizational and especially industry structures, and both are finally related to the IS development industry. The preliminary result of this section is the understanding that inter-organizational product development is more complex in IS than the same process in other industries. However the same underlying rationales guide the trends in this industry. The fundamental part also discusses various perspectives through which the change within the IS development industry can be analyzed. A teleological perspective is selected for the more detailed analysis within the following two sections.

The second section of this chapter focuses on the first research question why firms join inter-organizational networks. In order to answer this question, first a brief discussion of organizational structures in general is conducted. In this context, it is argued that an organizational structure can be understood as a certain division of labor and its accompanying coordination mechanisms (Mintzberg, 1979b). From an industry level, the main distinction between an inter-organizational and an intra-organizational structure is therefore, that in the first the division of labor reaches across organizational boundaries, while for the latter, division of labor is achieved within the boundaries of one organization. One of the predominantly used theoretical frameworks for answering the question of when one structure promises to be superior to the other is the resource-based view (RBV, Dierickx and Cool, 1989; Wernerfelt, 1984; Barney, 1991). In this framework, all assets[1] that have some influence on a firm's processes can be considered as resources. In this context, inter-organizational structures emerge if some of these assets are sourced from a third party. A key aspect of the RBV is that especially these resources are sourced form third parties, which are difficult to obtain. Thus, one of the conclusions of this section is that organizations join inter-organizational networks especially when they are in need of resources that they do not posses and that are difficult to obtain (Eisenhardt and Schoonhoven, 1996; Grant and Baden-Fuller, 2004). As the discussion of resource considerations in the IS discipline is still at an early stage (Wade and Hul-

[1] The idea of a resource is indeed held very general. See Section 2.2.1.1 for a definition, and also a critique of this fact.

land, 2004), the strategic management field is consulted. Based on this discussion, a set of broad resource categories is developed that promise to be driving organizations into participating in organizational networks. These resources are then discussed within the specific scope of IS development, and here also from the perspective of large, global IS development organizations as well as from the perspective of their niche partners. The result of this discussion is a set of *propositions*[2] why it is beneficial for large and small software developers to participate in the inter-organizational network as it has been conceived in the first part of this chapter.

The third part of this chapter then covers the second research question and addresses issues concerning the management of the emergent inter-organizational structure in the IS development industry. The deliberate management of such an inter-organizational network is important, as frictions in the cooperation can potentially offset the above discussed benefits of this approach. As has been mentioned in the introduction, these management issues largely stem from two related sources. Concerns about the behavior of organizations that participate in the network and concerns about the complexity of integrating the externally obtained resources. The first aspect has been widely covered in organizational and economic theories. Especially the hazardous implications of the combination of bounded rationality with opportunistic behavior for inter-organizational relationships has been addressed in transaction cost theory (e.g. Williamson, 1985), in agency theory (e.g. Eisenhardt, 1989a), and in the theory of incomplete contracts and property rights (e.g. Alchian and Demsetz, 1972). After discussing the underlying assumptions in more detail, these theories are thus introduced in considerable detail. The result of this discussion is a broad understanding how such relationships can be managed in order to ensure a smooth cooperation despite these behavioral issues. The second aspect of complex inter-dependencies between organizations has also been addressed in various theoretical approaches. These approaches are therefore also introduced. On this basis, a discussion of various coordination mechanisms that can be used to manage such complex relationships is conducted. Interestingly, the discussed mechanisms to counter behavioral and complexity issues are very closely related to each other. Subsequently, the potential of these mechanisms is discussed especially in the IS development context. Similar to the first research objective, this discussion results in broad propositions how inter-organizational relationships in the IS development context are managed. These propositions are then used to structure the further empirical research conducted in the following chapters.

[2] The fact that this term is chosen for the here developed relationships is based on the work of Bacharach (1989). He argues that, "while both propositions and hypotheses are merely statements about relationships, propositions are the more abstract and all-encompassing of the two" (p. 500).

2.1 Foundations of Inter-Organizational IS Development Networks

As this section is intended to establish a common understanding of the context of this work, the first part is a brief discussion of what exactly is understood under the term *IS development*. This drills down from very general concepts for both IS themselves and their development, towards a definition of manageable complexity. It furthermore covers idiosyncrasies of IS, which are one of the key motivators to study inter-organizational networks especially in the IS development industry and are consequently of prime importance throughout this entire work. After this, the idea of *modularity* in IS development is introduced. This is done first through a rather theoretical discussion of general systems theory. This section introduces the main ideas from this theory, which can be considered to be very of fundamental value for this work[3] Based on these concepts the actual setting is prepared. It is argued that a modular *product design* entails various advantages over a monolithic product design (Baldwin and Clark, 2000). Consequently, IS are also designed along this principle. However, in order to reap the full benefits of such an approach, it is desirable to design *industry structures* along the same lines as the goods that the organizations in this industry produce (Conway, 1968). Consequently, a modularized, inter-organizational IS development industry is proposed. Despite the fact that this demand has been raised now for almost forty years (see McIlroy, 1969, for an early example), it is argued that the above mentioned idiosyncrasies of IS development render such an inter-organizational approach even more difficult in this industry than in others.

Yet, recent technological developments, especially the emergence of the concept of Service-Oriented Architectures (SOA), promise to reduce the impact of these special properties and thus open a window of opportunity to make such an inter-organizational structure in the IS development industry possible. However, this industry is still far from the level of inter-organizational division of labor that can be found in other engineering disciplines. Since this industry change is not yet thoroughly understood, various potential perspectives can be employed in order to gain a deeper understanding of this development. Two of these perspectives are discussed in the final section of this introductory part, and one of them is adopted to guide the further research approach. Through this perspective, the fundamental research questions that have already been introduced are discussed in due depth throughout the following two sections of this chapter.

2.1.1 Information Systems and Their Development

It is the goal of this section to clearly define the scope of the present work. This definition is subdivided into three distinct aspects. First, a brief introduction to the IS discipline in general is given. The goal of this discussion is a clear understanding of what an

[3] This perception is also mirrored in the IS literature, where O'Brien and Marakas (2006) for example argue that general systems theory should be a pillar for all activities related to IS development.

enterprise IS actually is. Second, the development of these enterprise IS is discussed. This includes a distinction of the degree of detail that is chosen for this study, as well as a brief history of software and IS development. Finally, idiosyncrasies of IS development in comparison to other product development disciplines are discussed. Here especially the fact that IS are information and intellectual goods is of prime importance. These fundamental issues are referenced frequently throughout the remainder of this study, so their clear definition is imperative at this early stage of the discussion of theoretical backgrounds.

2.1.1.1 Fundamentals of Information Systems

Before defining IS *development* a clear understanding has to be established what exactly constitutes an *information system*. Frequently, the term is used interchangeably with *information technology* (IT), which is however, obstructive to the deeper understanding of the differences and relations between the two concepts (Ward and Peppard, 2002). Therefore, this work is based on the layered definition given by Avison and Fitzgerald (2003). As has been mentioned in the introduction, on the most basic layer, an IS used in an organizational setting is defined as any system providing useful information to various stakeholders of the organization, which includes for example the members or the clients of the organization. Ideally this information is used by the organization to be more efficient, more effective, or both. This definition in itself does not yet contain any technological aspects of IS, which reinforces the perception of Ward and Peppard (2002, p. 3), "that information systems existed in organizations long before the advent of information technology and, even today, there are still many information systems present in organizations with technology nowhere in sight." Following Avison and Fitzgerald (2003) on their way to a narrower definition of IS, the next step is that of a *formalized* IS. A formalized IS is contrasted to informal ones, such as rumors, gossip, or gut feelings, which might also be sources of (more or less) valid information. However, their informal nature makes a concise study of them almost impossible, and definitely beyond the scope of the discipline of IS research. The final reduction of IS narrows the definition down to those IS that are addressed in this work: That of a *computer-based* IS[4]. These promise (for specific tasks) to be superior to manual IS because ideally a "computer can process data (the basic facts) speedily and accurately, and provide information when and where required, which is complete and at the correct level of detail, so that it is useful for some purpose" (Avison and Fitzgerald, 2003, p. 4). This reliance on computers for IS is also echoed in the narrow definition by Ward and Peppard (2002, p. 3): In his perception, IS are "the means by which people and organizations, utilizing technology, gather, process, store, use and disseminate information."

[4] By virtue of their computer-based nature these have to be formalized IS.

Consequently, information *systems* should not and cannot be considered equal to the *technology* they are based upon. Therefore, IS are often more narrowly defined as consisting of the software (i.e. the computer programs) and excluding the hardware (i.e. the computer machinery). However, as Sommerville (2004) notes, this definition is also not correct. Software is usually equated with one single computer program or application, while a system consists of multiple interconnected applications that are furthermore used by different individuals to achieve a common goal of an organization. Consequently, IS cannot be considered without their environment (Checkland and Holwell, 1998). Rather, they have to be considered to be composed of *people* using the system, the *domain knowledge* on task in which these people are supported through the system, and the *technology* on which the system is based (Heinrich, 1996). As a holistic treatment of the entire process from development over deployment to successful use cannot be realistically addressed within the scope of a single study without loosing focus (DeLone and McLean, 1992), this work especially addresses the development process of these systems. The focus is therefore on parts of the technology and task aspects. The user perspective is largely excluded. The technology aspect is especially limited to the software that is used in an organization. Other aspects, like computer hardware, telecommunication infrastructure, and the like are not considered. The task aspect is limited to the (mostly business- or process-related) knowledge embedded in the system. This embedded, domain knowledge is expected to largely stem from business or legal disciplines, but also includes other fields, depending on the area of application (Checkland and Holwell, 1998). To give an example, the logic whether a booking is compliant with certain accounting practices is considered part of an IS, as it is the software that actually alerts the accountant that a booking is not compliant. However, neither the actual computer that the accountant uses, nor the necessary training that the accountant receives in order to use the system is included.

2.1.1.2 Fundamentals of IS Development

Since the focus of this work is especially on the *development* of these systems, this term is subsequently defined. Avison and Fitzgerald (2003, p. 19) define IS development as "the way in which information systems are conceived, analyzed, designed, and implemented." Sometimes this discipline is also referred to as *systems engineering*, which is defined by Sommerville (2004, p. 25) as "the activity of specifying, designing, implementing, validating, deploying, and maintaining socio-technical systems." Obviously these definitions are again very broad in that they encompass both the hardware and the deployment of the system at the customer, aspects that have been deliberately excluded above. Thus, also for IS development, a narrower definition promises to disambiguate the field of inquiry of this work. The definition chosen to achieve this goal is closely related to that of *software* engineering. However, there is no clear understanding of the scope of this discipline in the literature. Avison and Fitzgerald (2003) for example argue that, although software engineering is a part of the IS development process, it does not

encompass such activities as understanding of the problem, understanding the needs of the user, or deciding whether a system is needed after all. Contrary to this, for Sommerville (2004, p. 7) this discipline refers to "all aspects of software production," also including especially those capabilities mentioned above. Recognizing the fact that there is no ultimately valid definition of the term, IS development is defined here as including all the skills necessary to (further) develop[5] either the technical base, or the embedded knowledge of a system. Again this scope is limited through largely excluding the user perspective. Augmenting the above given example, a change in the legal environment of accounting that entails a change in the used software is considered to be part of IS development. A change in organizational responsibility that entails the organizational relocation of using a software from one department to another without changing the actual system is not part of IS as it is understood here.

Another important issue when delineating the scope of IS development for this study, is the level of detail on which IS development is considered. As Iivari et al. (2000) note, the field of IS development is characterized by a multiplicity of different methods, principles, techniques, and tools, which makes it almost impossible to only get a general idea of all of them. As will become clearer throughout the rest of this fundamental part, it is not the intention of this work to add another method, tool, or principle to this *methodology jungle*. Rather, it is the stated goal to contribute to a better understanding of the structure of the IS development industry, and here especially the trend towards an inter-organizational structure that has been initiated by the wide-spread adoption of SOA that has already been discussed briefly above. With that scope in mind, it can be safely stated that this work addresses issues that Iivari et al. (2000) subsume under the heading IS development *paradigm*. These very general paradigms guide the assumptions which translate into more concrete methods or tools at lower levels of the hierarchy of IS development paradigms[6], approaches, methodologies, and techniques proposed by Iivari et al. (2000) and illustrated in Figure 2.1.

In this context, the topic of this study can be considered a paradigm *shift*. Until recently, the dominating paradigms in IS development have been whether they have been developed in a *generic* or a *bespoke* way. The first type of systems are defined by Sommerville (2004, p. 5) as "stand-alone systems that are produced by a development organization and sold on the open market to any customer who is able to buy them," the latter as "systems which are commissioned by a particular customer," and which are developed "especially for that customer." To gain a better understanding of the backgrounds, the relation between these two types of systems is subsequently illuminated through a brief discussion of the history of IS development.

[5] Especially the notion of enhancing the system as part of IS development has to be emphasized here. The line between IS as a product in comparison to a service is blurred in this context (Cusumano, 2004).

[6] It is also important to state that this "highest level of abstraction is that which connects research on [IS development] to alternative (...) research communities" (Iivari et al., 2000, p. 186) - namely that of organizational science and strategic management in this case.

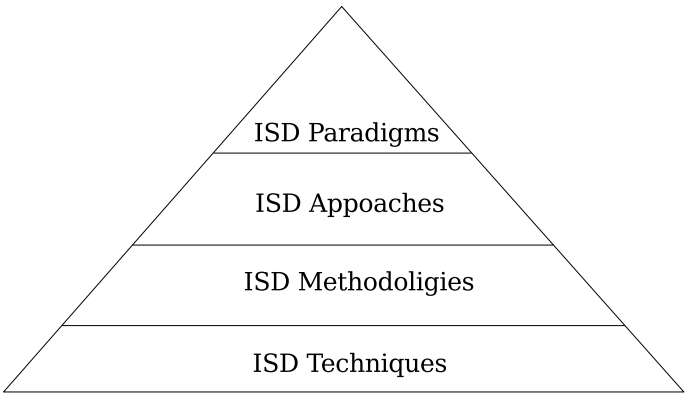

Figure 2.1: The ISD Paradigms, Approaches, Methodologies, and Techniques Hierarchy. Source: Adapted from Iivari et al. (2000, p. 189).

When the first computers were sold to corporations during the 1950s, there was hardly any market for commercial software - the term software itself had not even been coined until 1959 (Campbell-Kelly, 1995). In this environment, there were three distinct ways of acquiring the needed computer programs: They were bundled with the hardware; they were exchanged freely through communities of interest; or they were developed in-house by hired computer staff (Campbell-Kelly, 1995). In this context, a demand for *custom* programs emerged - programs that were not supplied by the hardware vendor, that could not be acquired through a community of interest, and that could not - or were not intended to - be produced in-house. This market opportunity has been seized by software contractors, companies that supply exactly these computer programs. In 1965, there were about forty to fifty large, and an uncountable number of small contractors that developed individually designed software for their customers (Campbell-Kelly, 1995; Haigh, 2002).

However, this individually designed nature of the computer programs changed - albeit slowly - during the late 1960s and the early 1970s. A reason for this can be found in the rapid development of hardware technology as opposed to the rather slow development in software productivity (often referred to as the software crises). Campbell-Kelly (1995) points out that during the 1960s, computer performance has increased by two orders of magnitude, while software productivity has only increased by a factor of two to three. Consequently, there has been a growing gap between the available capacities of computers, and what was needed by custom made software running on them. Thus, it has become less feasible for companies to develop each piece of software they use from scratch, either by themselves or through software contractors. This, in combination with the fact that under growing pressure of the U.S. Justice Department, IBM decided in 1969 to unbundled its hardware from its software (Costello and Gomes-Casseres, 1992; Cusumano, 2004; Haigh, 2002), has persuaded several software contractors to convert their existing software into pre-packaged, standardized software solutions that could not

only by used by one, but by many different customers (Campbell-Kelly, 1995). Despite the fact that in 1970 still an overwhelming majority of software spending has been dedicated to software contracting, the development towards the use of standardized software packages that started in this time could not be stopped. It culminated in today's dominance of these standardized enterprise IS, which has already been touched upon in the introduction.

The underlying fundamentals that lead to this distinction between generic and bespoke systems are well recognized in the literature. Markus and Robey (1988) for example discuss the difference between technological and organizational imperatives. The first refers to a situation in which technology is perceived as "exogenous force which determines or strongly constrains the behavior of individuals and organizations" (p. 585). This describes neatly the idea behind generic systems, in which organizations have to adapt to the systems they use. The latter refers to a situation in which an organization has "almost unlimited choice over technological options and almost unlimited control over the consequences" (p. 587). This again very well illustrates the idea behind bespoke systems, in which systems are even individually designed in order to fit to the organization using them. However, just as Markus and Robey (1988) argue for an *emergent perspective*, in which organizations and technology engage in complex interaction with uncertain outcome, Sommerville (2004, p. 6) recognizes that "the line between these types of [systems] is becoming increasingly blurred." He bases this perception on the fact that, especially large, standardized systems can be extensively modified to include customer-specific business- or process-knowledge. Exactly this change in paradigm for IS development is the key aspect of this study. However, on the one hand, measuring up to other engineering disciplines requires more than just the ability to modify large systems. On the other hand, IS possess certain idiosyncrasies, which make it difficult for their development industry to realize the benefits that are proposed to come along with such an approach. Which these idiosyncrasies are, is discussed subsequently.

2.1.1.3 Idiosyncrasies of IS and Their Development

IS as Information Goods. The first idiosyncrasy of IS is the fact that they are *information* goods. Under this term, Shapiro and Varian (1999b, p. 3) subsume "essentially anything that can be digitalized - encoded as a stream of bits." Obviously, the software and the knowledge embedded in this software belong into this category. Therefore, a discussion of the properties of these goods promises to yield significant insights for the IS development industry. Usually, the distinct properties of information goods are distinguished as to whether they originate from the product itself, or from the interaction of a number of related products (Shapiro and Varian, 1999b).

Concerning the first group, there are various characteristics that differentiate an information good from a non-information good (which are mostly tangible ones). Obviously these characteristics are not a binary either-or distinction between the two types of products. Rather, information goods tend to display significantly more or less of each

property than non-information goods. Within each group of goods there are also subtle nuances. Not all information goods display the same degree of each property. The first, and probably most important, aspect that stems from the nature of information goods is the so-called *first-copy* effect. Shapiro and Varian (1999b, p. 3, emphasis in original) summarize this effect with their statement that "information is costly to *produce* but cheap to *reproduce*." With other words, once the book is written, the music recorded, or the software coded it is easy - and cheap - to print another book, press another CD, or download the software again. Consequently, information goods are subject to economies of scale to a larger extent than non-information goods.

The second, closely related, effect is that information goods possess the property of *non-rivalry*. This indicates that the product is not exhausted through consumption. Thus, an essentially infinite number of consumers can benefit from using the good without diminishing the benefits of the other consumers. So, for example a book can be easily shared among different readers, or a CD can be used by various listeners, without the fact that the second reader or listener has any adverse effects either for himself or for the first person. The concept of non-rivalry is of special importance in combination with the first-copy effect. Especially in the context of electronic media, a copy can be made almost for free, even for end-customers. Thus, these customers can easily copy their CD and share it their friends. Since these then do not have to buy the CD, the revenues of the recording company are reduced. This aspect is commonly referred to as *non-excludability* of information goods. This indicates that it is difficult to prevent people from using an information good[7]. Especially in the field of electronic media, this has enormous consequences - ranging from intense research in technical copy protection to the use of legal prosecution of software piracy.

The final, and in the context of IS development probably most important, aspect of information goods is that they have to be considered as *experience* goods. The fundamental idea of these goods has been first raised by Nelson (1970), who argues that there are essentially two distinct means to evaluate the quality of a product. The first is *search*, which refers to inspecting the good *before* purchasing it. The second is *experience*, which refers to inspecting the good *after* purchasing it. The consideration of which way to go obviously depends on the costs of inspecting before purchasing in comparison to the costs of purchasing. For very cheap products, experience is the appropriate way: "To evaluate brands of canned tuna fish, for example, the consumer would almost certainly purchase brands of tuna fish for consumption" (Nelson, 1970, p. 312). In a similar vein, Shapiro and Varian (1999b, p. 5) give the example of a newspaper as an experience good: "How do you know whether today's *Wall Street Journal* is worth 75 cents until

[7] Products that possess the property of non-rivalry and non-excludability are referred to as *public goods* in economic theory. The theoretical foundation for the concept of public goods has been laid by Samuelson in two short essays in 1954 and 1955. A common example for a public good is a lighthouse. An additional ship watching the lighthouse does not have any deteriorating effects on the other ships and it is almost impossible to prevent a ship from watching the lighthouse (Rutherford, 1992; Eatwell, 1987).

you've read it? Answer: you don't." However, even for expensive goods, the costs of experience might be lower than those of search. Nelson (1970) gives the example of appliances, the quality of which is difficult to assess for a customer by inspection. Thus, in this context, experience is the better way of quality assessment. The same holds true for complex IS, for which quality is a multi-facetted concept of for example as-is utility and future maintainability (Boehm et al., 1978). Thus, for those systems, it is close to impossible to assess the real value of the good without purchasing (experiencing) it[8].

Besides these aspects that stem inherently from the information good itself, there is also an important implication resulting from the interaction between these goods. Commonly information goods are subject to so-called *network externalities*. This concept refers to the idea that a product becomes more valuable through the fact that it is used more often. The simplest form of network externalities are *direct* network externalities. Here the added value stems directly from the installed base of products. These direct network externalities are for example the basis for Metcalfe's Law, which states that the total value of a network roughly equals the square of the number of compatible devices in the network. This can be explained through the simple example of fax machines. The first fax machine does not have any value, whom are you supposed to send a fax, if you are the owner of the only machine? However, if someone buys a second machine, this second machine does not only add value for the owner of it, but also significantly for the owner of the first one. The third machine again adds value to all three owners, and so on, and so forth. Thus, the larger the network, the more value is added by adding another member. Besides these direct effects, there are also *indirect* network externalities. These are the result of products complementary to a certain platform. Through adding more complementary products for a specific platform, this platform becomes more valuable. So through this indirect influence, a network of products emerges, although the single products are not directly connected to each other. Consequently, even without direct connection the products influence each other. To bring another example, the fact that your neighbors own a video recorder does not make your video recorder function any better than before. However, the fact that your neighbors' owning of a video recorder attracts a video rental store to your neighborhood increases the value of your video recorder enormously[9].

Therefore, through network externalities - no matter whether direct or indirect ones - a *positive feedback loop* is initiated. Positive feedback loops are a general concept that refers to the fact that the growth of something is subject to the size of it. Applied in the context of network externalities, a large installed base of a certain product makes this product even more attractive. So, once a certain product has reached a substantial market share, this market share itself is reason enough for customers to decide for exactly this product. Obviously there is a downside of this effect, namely that without reaching

[8] Sometimes it is difficult to correctly assess the value of an IS even after it has been purchased. See the discussion on the productivity paradox in Section 2.1.2.4

[9] This paragraph is largely based on Shapiro and Varian (1999b)

a substantial market share there is no way that a product can become a commercial success. This is also the reason why organizations that operate in information industries are keenly concerned with developing a dominant market position (Shapiro and Varian, 1999a; Liebowitz and Margolis, 2001), ideally as that company that provides the platform which is complemented by other products (Morris and Ferguson, 1993; Gawer and Cusumano, 2002).

IS as Intellectual Technology. The second idiosyncrasy of IS is the fact that IS have to be considered an *intellectual* rather than an *industrial* technology (Lee, 1999). The main difference between these two types of technologies is the constraint that physical characteristics have on their application. So, while industrial technologies are limited by their physical appearance to fulfill a certain requirement, intellectual technologies are exactly not constraint by physical aspects, but only by the imagination of their users, they can be used "in virtually unlimited ways to solve problems or organize information" (Curley and Pyburn, 1982, p. 33). Thus, both technologies differ in the point in time, when their functionalities are defined. While industrial technologies have a well-defined set of functionalities from the moment their design is completed and they are produced, this is not true for intellectual technologies (Curley and Pyburn, 1982). Rather they can be programmed, or dynamically adapted, to the requirements of their users. In the words of Lee (1999, p. 8) they "can be innovated endlessly, depending on its interaction with the intellect of the human beings who implement and use it."

Also, there are manifold occasions when this adaptation of IS is desirable. An example would be the fact that IS are dependent on the strategy of the organization that uses them.[10] While it is not the intention of this work to either give a complete list of reasons why IS should be changed or to give a comprehensive overview over strategic IS planning, it is important to mention that this IS planning is not a singular event. Rather, as Ward and Peppard (2002, p. 135) state it, once "a strategy process is instituted, it should become a continuously evolving process, where the strategies and plans are refreshed regularly and even frequently, according to external forces, business needs and opportunities, the planning timetable, culture of the organization, and the benefits delivered by implementation of the strategy." Thus, IS have to be considered a technology that is in constant flux. What has been state-of-the-art today is outdated tomorrow, a perception even further reinforced by the enormous pace of change in technology upon which the here discussed computer-based IS are based.

Taken together the intellectual, information nature of IS makes them a highly specific field of inquiry that necessitates a cautionary stance when comparison it with reference disciplines (Keen, 1980). Nevertheless, subsequently principles from product development are discussed as a fundamental pillar for this work. This discussion is based on

[10] This is discussed in the literature under the label of strategic *alignment* between IS and business. Without going into more details of this issue here, the reader is referred to Henderson and Venkatraman (1993) and Earl (1993) as the standard works on the topic.

general systems theory, which is the basis for many of the introduced principles, and is thus briefly introduced in the next section. Then the general ideas of modularity in product development are discussed. Based on this discussion, it is then argued that an inter-organizational industry structure promises to be the most efficient approach to realizing these ideas. However, as it has been argued that a comparison with reference disciplines is difficult, a close analysis shows that indeed, the here described two aspects of IS - the facts that they are information goods and intellectual technologies - have a severely deteriorating impact on the application of general product development principles to the IS context. Especially the attempt to realize IS development through an inter-organizationally structured industry seems to be highly difficult because of the co-existence of these two idiosyncrasies. This explains why the paradigm to develop IS - albeit technically modularized - within one large enterprise has been dominating the industry throughout the last three or perhaps even four decades.

2.1.2 Inter-Organizational Networks

After having discussed what is understood under IS, how they are developed, and what their idiosyncrasies are, the following sections address the structure of these systems, the organizations that develop them, and the industry that these organizations constitute. First, the foundations are laid through a discussion of properties of hierarchical, loosely coupled systems in general. The underlying ideas of general systems theory are then transferred to product design in general and specifically to IS development. As a next step, it is argued that modularized products promote the adoption of modularized (networked) organizational and industry structures. Thus, various different aspects of these structures are illuminated in due depth. Finally, the above discussed idiosyncrasies of IS development are reintroduced and it is argued that so far an adoption of these inter-organizationally modularized industry structure has been difficult if not impossible. However, it is also argued that recent technical changes could have the potential to facilitate this adoption.

2.1.2.1 General Systems Theory

The concept of general systems theory is based on the perception of von Bertalanffy (1950, p. 135) that "similar fundamental conceptions appear in all branches of science, irrespective of whether inanimate things, living organisms, or social phenomena are the objects of study." He therefore argues that these similarities should be studied across the different disciplines and suggested to call the field appropriately *general* system theory. As a motivation for this endeavor he mentions the understanding of the "vague, muddled and metaphysical" notion of systems that "the whole is more than the sum of its parts" (von Bertalanffy, 1950, both p. 142). With the same motivation, Simon (1962) further elaborates on this issue. He analyzes the internal setup of *complex* systems, which he defines as those "made up of a large number of parts that interact in a nonsimple

way[11]." The central argument of Simon (1962) is that such complex systems are often *hierarchical* in nature. In his perception, a hierarchical system is one that is composed of a set of interrelated subsystems; each of these subsystems is, in turn, composed of other subsystems, and so on, until finally a lowest level of elementary subsystem is reached. Obviously, these elementary subsystems are somewhat arbitrarily chosen[12]. However, such a distinction has to be made at some point, in order to actually apply the ideas of general systems theory in a meaningful way.

Such a hierarchical system is considered to be advantageous over non-hierarchical systems because it also possesses the property of being *loosely coupled*. *Coupling* is often used "synonymous with worlds like connection, link, or interdependence, yet each of these latter terms misses a crucial nuance" (Weick, 1976, p. 3). The crucial nuance that Weick (1976) mentions is made more explicit by Orton and Weick (1990). In their discussion on loosely coupled systems, they propagate their perception that there are two different interpretations of loose coupling. One is the unidimensional interpretation, which is also basis of the critique by Weick (1976). Here, the degree of looseness (or tightness) is seen as an extreme on the continuum between *distinctiveness* and *responsiveness*. If subsystems of a given system are characterized as being distinctive, their connections, links, or interdependencies are of very low intensity. In contrast, if subsystems of a given system are characterized as being responsive, their connections, links, or interdependencies are of very high intensity. Thus, the more intense these connections, links, or interdependencies are, the tighter a system is coupled. Contrary to this, the dialectical interpretation sees loose coupling as the *coexistence* of responsiveness and distinctiveness. In this interpretation, parts of loosely coupled systems strive for distinctiveness, while at the same time retaining responsiveness to the other parts. Figure 2.2 illustrates this two-dimensional, dialectical perspective. It is furthermore explained by Orton and Weick as follows:

> If there is neither responsiveness nor distinctiveness, the system is not really a system, and it can be defined as a *noncoupled system*. If there is responsiveness without distinctiveness, the system is tightly coupled. If there is distinctiveness without responsiveness, the system is decoupled. If there is both distinctiveness and responsiveness, the system is loosely coupled (Orton and Weick, 1990, p. 205, emphasis in original).

[11] This albeit vague definition is also mirrored in the work of von Bertalanffy (1950, p. 140): "We can isolate processes occurring in the living organism and describe them in terms and laws of physio-chemistry. This is done, with enormous success, in modern biophysics and biochemistry. But when it comes to the properly 'vital' features, it is found that they are essentially problems of organization, orderliness, and regulation, resulting from the interaction of an enormous number of highly complicated physio-chemical events."

[12] von Bertalanffy (1950, p. 141) also recognizes this arbitrary choice of elementary level: "You cannot resolve the individuals within a (...) social unit into cells and finally into physio-chemical processes. Very well, take the individuals as units, and eventually you will get a system which is not physics but is of the same form as exact physical science."

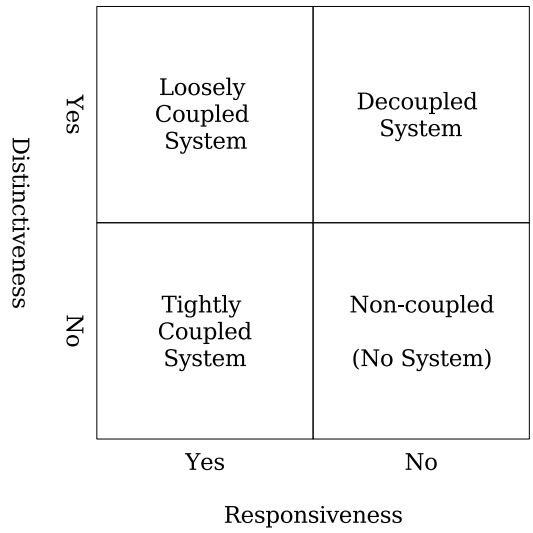

Figure 2.2: A Dialectical Perspective on Systems Coupling.
Source: Based on Orton and Weick (1990, p. 205).

Simon (1962) also discusses advantages of these loosely coupled systems in comparison to tightly coupled, integrated systems. Foremost, since dysfunctions are usually confined to one of the subsystems and do not affect the other subsystems, these systems promise to be more stable. Simon (1962) very well illustrates this with the example of the two watchmakers *Hora* and *Tempus*. The first relies on stable subassemblies for the watches he makes, the second attempts to assemble his watches in one pass. Even if it is assumed that Hora's approach entails more effort for producing these stable subassemblies, the fact that he can safely pause and resume his work pays off manifold in the example of Simon (1962) in which both watch makers are so jumpy that they drop their current workpiece if they get interrupted.

Furthermore, since complex, hierarchical systems can be built upon existing subsystems, their development promises to be possible at a faster pace than if systems were not hierarchical in nature and had thus to be developed from scratch each time. The most illustrative example that Simon (1962) offers for this aspect is that of *empire building*[13]. He argues that Alexander the Great built his empire through the assembling of smaller nations. The existence of stable political systems was therefore a prerequisite for his success, and "where this condition was not fulfilled, as on the Sycthian and Indian frontiers, Alexander found empire building a slippery business" (Simon, 1962, p. 473).

The final advantage of hierarchical systems is based on limited cognitive capabilities of man. Every complex system easily surpasses the ability of any single individual to understand it. Therefore breaking the system into subsystems allows the studying of one

[13] Remember that general systems theory is termed *general*, because it can be applied in all different settings!

of these at a time. Therefore, only through this structure is it possible "to understand, to describe, and even to 'see' such systems[14]" (Simon, 1962, p. 477). As the discussion has shown, all these advantages arise naturally for all systems that have the properties of being hierarchical and loosely coupled - hence the name general systems theory. Considering these advantages, engineers of all disciplines have therefore deliberately attempted to copy these properties when designing complex man-made systems. This approach is termed *modularity* and discussed in the following section.

2.1.2.2 Modular Product Design

As it has been mentioned, the principle of *modularity* describes a close resemblance of artificial product design with the principle of loose coupling between hierarchical subsystems in general systems theory. This becomes very obvious when considering one of the most prominent definitions of modularity. Baldwin and Clark (1997, p. 85) define the concept as "building a complex product or process from smaller subsystems that can be designed independently yet function together as a whole." The principal of modularity is not new. Actually it has been applied ever since complex products are developed. Therefore a multitude of examples for products exist that are designed along this principle. One commonly cited is the automotive industry in the early 20th century. An increasing complexity of the products forced car manufactures to switch to modular product design. It is even argued by Womack et al. (1990, p. 26 ff) in their highly influential book *The Machine that Changed the World* that this development has to be seen as the key factor for mass production in the automotive industry: "The key to mass production wasn't (...) the assembly line. Rather, it was the complete and consistent interchangeability of parts and the simplicity of attaching them to each other."

This interchangeability of parts[15] can be achieved through the adherence to a predefined modular product *architecture*. Ulrich (1995) defines a product architecture as consisting of three parts: (1) functional requirements; (2) the mapping of functional requirements to components; and (3) the specification of interfaces for interacting components. Such an architecture is characterized as being modular if two conditions are fulfilled. First, functional requirements have to be mapped one-to-one on components. Second, component interfaces have to be loosely coupled. An interface between components in turn is defined as being *coupled*, "if a change made to one component requires a change to the other component in order for the overall product to work correctly" (Ulrich, 1995, p. 423). A loosely coupled interface is consequently one, in which changes

[14] As Simon (1962) notes it is by no means clear what is cause and what effect in the relation between man's ability to see hierarchical systems and their prevalence in nature. It might be possible that many natural systems are *not* hierarchical in nature, but that these systems escape our attention because we are unable to see them. If this would be the case, not the hierarchical nature of systems would facilitate our understanding of those systems, but our understanding of hierarchical systems would explain their prevalence in nature.

[15] Subsequently, the terms *parts*, *modules*, *components*, *subassemblies*, and *subsystems* are used interchangeably for each other.

in one component can be made without necessitating changes in other components[16]. Only through such a modular product architecture as defined here, mixing and matching of components becomes possible. This in turn allows for a realization of the above mentioned advantages of hierarchical, loosely coupled systems in the context of product development (Schilling, 2000).

Another case in point for this kind of development is offered by Baldwin and Clark (2000) and their discussion of the first modular design of a computer (focusing on the hardware). "In the large systems era of the 1960s and 1970s, when mainframes were the norm, computers were built from the ground up with proprietary hardware and architectures and unique components" (Costello and Gomes-Casseres, 1992, p. 2) - a truly monolithic system with all the associated disadvantages: "The support of older applications and systems was becoming a problem of nightmarish proportions. For users, taking advantage of new technology meant writing off investments in old systems and software, and moving all their data to new formats and locations" (Baldwin and Clark, 2000, p. 169). As customers were becoming more and more unhappy with this situation, IBM addressed the problem with the introduction of System/360 - commonly considered to be the first modular designed line of computers (Bresnahan, 1998). All members of this line of computers were able to use common peripheral infrastructure, and thus enabled customers to selectively upgrade their computer without abandoning their entire existing equipment. The move to modular product design paid off for IBM: By 1970 IBM had a market share of 70 percent in the computer business (Costello and Gomes-Casseres, 1992). Interestingly, the design of the operating system for the System/360 line of computers proved to be a great example for a *non*-modular design (Langlois, 2002). As Frederick Brooks, the project manager responsible for developing this operating system notes, the key concept behind the project has been that every programmer should be able to see all the materials. This cumulated into 150 pages of *daily* change notification that every individual was supposed to read (Brooks, 1982, p. 77). These experiences resulted in the famous *Brooks' Law*:

> Adding manpower to a late software project makes it later (Brooks, 1982, p. 25).

[16] Note again the close resemblance to the dialectical understanding of loose coupling. The components are responsive to each other in that they conjointly fulfill a certain set of requirements which could not be fulfilled if one of the components would be missing. However, at the same time the components are distinctive in that not necessarily all of them have to be changed after one is changed.

Once a certain size of project is reached, losses through coordination overhead outweigh the gains of division of labor[17]. Furthermore, some tasks simply cannot be divided among several individuals, thus render any addition of manpower useless[18]. This again emphasizes the importance of a clearly defined, modular product architecture. Through such an architecture it is possible to address these problems early on, and they can consequently be resolved within the planning phase of such a project. However, as it is explicitly discussed throughout the remainder of this section, it is difficult to apply the concept of modularity to IS development.

Modularity has traditionally been embraced by software developers early on (see for example the seminal article of Parnas, 1972) and is currently state-of-the-art, especially in object-oriented methodologies (Avison and Fitzgerald, 2003). However, modularity in the IS context proves to be more difficult than in pure software development. The main reason for this is the above described *intellectual* nature of IS. As changes to IS strategy are common, this also changes the functional requirements of the IS. This is likely to conflict with both defining characteristics of a modular product design given by Ulrich (1995). First, a clear one-to-one mapping is no longer possible, if functional requirements change. Second, interfaces between components of an IS are probably no longer de-coupled. The difficulty that is resulting from this lies in the fact that the architecture of an industrial product is the outcome of "architectural decisions (...) made during the early phases of the innovation process" (Ulrich, 1995, p. 419). However, as the architecture is exactly the *result* of this innovative process, the architecture to be applied in the innovative process itself cannot be predefined (von Hippel, 1990). Consequently, as using IS has been characterized as a continuous process of innovation (Lee, 1999), defining a modular IS crucially depends on an higher-level authority that communicates changes either in the functionalities or the interfaces to all involved parties, and furthermore also acts as settling authority for conflicts.

As long as this authority is involved, IS development can be conducted in a modular fashion. This is well reflected in the literature on benefits of reusing standardized software components. Reports of cost savings in the millions of dollars are not uncommon (Poulin et al., 1993). Albeit the inherent weakness of measuring software productivity through *lines of code* (LOC), several studies use this measure to show the effects of software reuse. One such research effort reports an increase in productivity from 500 to 800 LOC without reuse to 800 to 3200 LOC with reuse in a given timeframe (Matsumoto, 1989). Furthermore, there are reports of reducing the required development time of software projects by up to 44 percent through reuse of software (Henry and Faller, 1995). There are also studies that report a significant improvement in the num-

[17] This very well reflects the two research objective: First, how should tasks be divided among the various stakeholders. Second, how can the various organizationally dispersed tasks be managed in order to reduce these overhead losses? This question is addressed subsequently in Sections 2.2 and 2.3.

[18] Brooks (1982, p. 17) comments on this fact as follows: "The bearing of a child takes nine moths, no matter how many women are assigned."

ber of defects per LOC ratio (Coomer Jr. et al., 1990). Finally, two case studies that summarize and offer a perspective from practice on the topic of reuse of software can be found in Apte et al. (1990) and Banker and Kauffman (1991). However, while the software itself is designed modular and more or less standardized components are reused, this division of labor *between* organizations has not yet reached levels comparable to other engineering disciplines. Barnes and Bollinger (1991, p. 15) even argue that "most reuse producers (vendors) and reuse consumers (buyers) differ from their commercial counterparts primarily in that the transfer of products between them takes place within a single company or project, rather than across company or organizational boundaries." As the subsequent section shows, this inter-organizational division of labor within an industry is, however, a key necessity for realizing the full potential of a modular product development approach.

2.1.2.3 Modular Inter-Organizational Industry Structures

The advantages that result from the modular architecture of systems are not limited to product architectures. Rather, as it has been discussed in the section covering general systems theory, all types of modular systems enjoy these advantages. So, while a modular product design is in itself considered advantageous, it is usually only the first step in an ongoing development. As Conway (1968) argues, "organizations which design systems (...) are constrained to produce designs which are copies of (...) these organizations." Consequently, once a relatively stable product architecture has been established that is modular in a sense that it de-couples the various components that the system is composed of, it has been observed that the organizational structure also follows this design pattern (Hoetker, 2006; Schilling and Steensma, 2001). This is assumed to happen first within a single company and as a final consequence, across the boundaries of different companies in an industry. These companies in such an industry are assumed to be vertically disaggregated and focused on single, well-defined components of the industry's products (Staudenmayer et al., 2005). Contrary to the perception of Langlois (2002) that the application of modularity to an organizational level is new, organizational and especially industry structure always followed product design in this way. Galvin and Morkel (2001, p. 31) very well illustrate this through the example of the world bicycle industry. As they argue, in this industry modularity on the product level is well established, "with most components having defined interfaces for over 50 years." If the above made prediction holds true this should result in bicycle industry that is vertically highly disaggregated. This is exactly what has been observed:

> Each segment of the industry tends to exhibit high levels of independence and there are very few examples of firms operating in multiple segments of the industry simultaneously. For example, Shimano is the largest and most well-known firm in the bicycle industry. It manufactures approximately 80 per cent of the world's supply of brakes, gears, drive-train components and other

> mechanical parts (Friedland, 1993). However, it does not operate in any of the other bicycle industry segments. Giant and China Bicycle Company are the two largest frame manufacturers, though neither manufacture anything beyond frames (though some components are supplied via OEM contracts for labelling, such as Giant saddles) (Galvin and Morkel, 2001, p. 42).

Despite the fact that the bicycle industry can be described as being very far developed with regard to the modularization of its organizational structure, there are other industries in which similar trends are observable. Dahmus et al. (2001) for example discuss electronical tools, Langlois and Robertson (1992) present the setting of high-fidelity and stereo components, and Staudenmayer et al. (2005) mainly focus on electronical high-tech devices. As the last industry setting seems to be most prominently discussed in the literature, in the following this study especially focuses on the discussion of the computer hardware industry as an example. There are two reasons for this. First, this industry has also been used as an example during the previous section. Second, the widespread presence of this industry in the literature guarantees that information is readily available.

In the preceding section, the history of IBM and the design of computer hardware have been sketched up to the 1970s, when the emergence of the modular designed System/360 earned IBM a dominant position in this industry. This story very well illustrates the advantages that a modular product design entails. However, an even bigger success story of computers began during the early 1980s, when IBM introduced the architecture for its personal computer (PC). This small computer intended for everyone's personal use (hence the name), has been based on pre-defined components, developed by other (non-IBM) organizations. The main impetus behind this development has been the fact that IBM controlled the *Basic Input-Output System* (BIOS) code, which it assumed would be the crucial part of the overall system - a clear misconception, as in 1983 Compaq was able to legally clone IBM's BIOS code (Gawer and Cusumano, 2002). However, as this was not foreseeable, IBM decided to keep the architecture's interfaces open, and readily contracted different partners in order to develop components for this newly designed IBM PC. Among these partners have been the prominent examples of Intel for the micro-processor or Microsoft for the operating system, but also other, smaller companies for memory, hard drives, and all other types of peripherals (Baldwin and Clark, 2000). Thus, similar to the trends that have been observed in the bicycle industry during the last fifty years, the successful modularization on the product level entailed a development towards a modular industry structure:

> IBM's decision to allow the PC system interfaces to remain open spurred the production, commercialization, and adoption of PCs all over the world. As the PC became ubiquitous, a fundamental transformation occurred in the computer industry: Previously vertically integrated companies (e.g. IBM, DEC, Univac, Wang) started to lose leadership to specialist providers of

> hardware and software components - among them Intel, Microsoft, and Motorola. Integrated PC makers like IBM and Apple still existed, but suppliers started to gain more and more power to dictate their conditions to their business environment (Gawer and Cusumano, 2002, p. 19 ff).

This change in the overall industry structure was so dramatically that "in 1996, 90% of the firms and 70% of the market value of all computer companies were in industry subclassifications that, practically speaking, did not exist in 1966" (Baldwin and Clark, 2000, p. 222). The dominance of IBM was broken, and today Microsoft and Intel are the largest firms in the PC market - hence the term *Wintel* for the Windows (the operating system of Microsoft) and Intel duopoly that set standards in the PC industry (Yoffie et al., 2004). This change in industry structure is well illustrated by comparing Figures 2.3 and 2.4, reproduced from Grove (1996). The first figure illustrates the computer industry around 1980, when companies - IBM being the dominating one - offered integrated computer solutions, ranging from the chip production to sales and distribution of the computers. Contrary to this picture, the second figure illustrates the computer industry around 1995, when specialized companies offered solutions for specific parts of the supply chain.

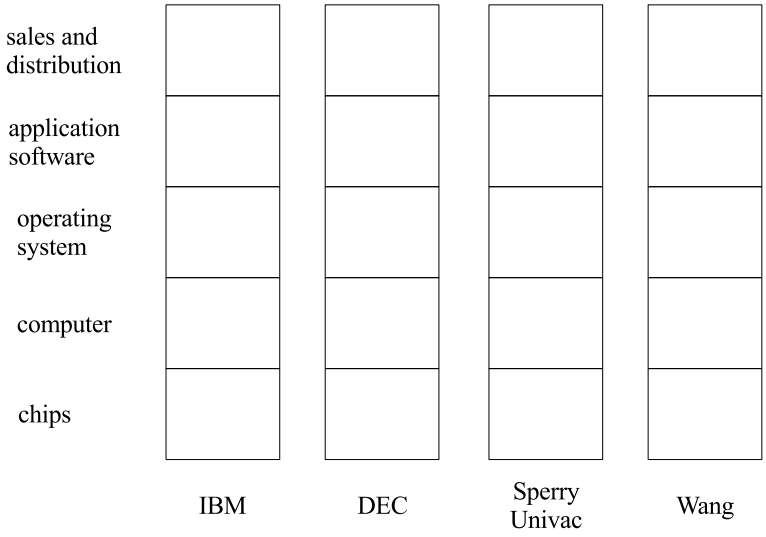

Figure 2.3: The Old Vertical Computer Industry - Circa 1980.
Source: Adapted from Grove (1996, p. 40).

A potential rationale behind this change in industry structure is discussed by Farrell et al. (1998). He argues that the differentiation between *closed* and *open* organization are key for understanding this change. In the first, customers can only buy a complete system from a single organization. This single organization is responsible for supplying all necessary components for the entire system. Contrary to this, in the latter structure

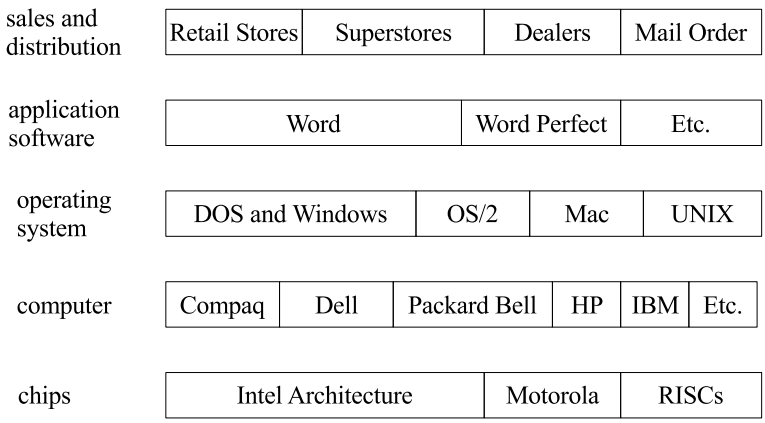

Figure 2.4: The New Horizontal Computer Industry - Circa 1995.
Source: Adapted from Grove (1996, p. 42).

customers can choose between different components from different sources. Thus, there is a certain degree of competition on the component level rather than only on the system level. In the terminology of Farrell et al. (1998) the first structure is beneficial for those companies that follow a *jack-off-all-trades* strategy: none of their components is outstanding, but all are good and therefore, in a closed setting, the overall system is the best one available. This has been the dominant paradigm of the early days of computer hardware, when IBM was following such a strategy. The latter structure in contrast is better suited for those companies that follow a *narrow specialist* strategy[19]. In this strategy a company focuses on a single, well-defined component and through this focusing on *core competencies* (Prahalad and Hamel, 1990) - those things organizations do especially well - the overall system benefits from the involved organizations' *learning curve* effects, which indicate that organizations are able to reduce the costs and/or increase the quality of their products with accumulated output (Hirschmann, 1964; Ghemawat, 1985).

This explains why the adoption of modular product architectures has repeatedly led to modular industry structures - also termed *networked* structures. The argumentation that for example Sanchez and Mahoney (1996) put forth for this relation between product and industry design is similar to that laid out above. Since modular product design is explicitly followed to minimize the interconnections between components, and - as for example the discussion on Brooks' Law above has hinted upon - small groups tend to be more effective than large ones, there is no reason to amalgamate large organizations into tightly integrated hierarchical structures that work on multiple, though indepen-

[19] The final type of strategy that is proposed by Farrell et al. (1998) is that of a *clear winner* - an organization that is best in all the necessary components. However, this structure seems unrealistic in almost all contexts and is thus not further discussed here.

dent components. A modularized network of independent organizations that each work on a specific component, and therefore fulfill the property of a one-to-one mapping of functions to components (Ulrich, 1995), promises to be more flexible (Sanchez, 1995) and thus guarantee a better ability of such organizations to react to a dynamic and highly competitive environment - exactly the advantages that have been proposed for hierarchical, loosely coupled systems.

This ability to adapt organizational structures to a changed environment and thus achieving a *fit* between the two has been identified by Miles and Snow (1984) as a prerequisite for organizational success. Since organizations are constantly interacting with their environment (Katz and Kahn, 1966), this environment also to a large extent determines how an organization is structured, and how this structure changes. Analyzing the history of organizational structures, Miles and Snow (1984) identify four major shifts[20] during the last two centuries. The first of these shifts occurred during the middle of the 19th century. Before the 1840s almost all businesses were operating through families or small partnerships. Chandler (1977) explains organizational structure first of all through the size of organizations. This size of organizations is in turn influenced by the technological base in transportation and production. As long as transportation and production relied on human or animal power, the output of single organizations was small enough to be handled in such small entities. The discovery of coal as a cheap and abundant source of energy - both for production and transportation - changed this. As Chandler (1977, p. 94) framed it, "the (...) first railroad boom provided a basic impetus to the rise of the large-scale construction firm and the modern investment banking house," and therefore paved the way for the emergence of modern industrial organizations. These early corporations were all characterized by a large and centralized structure. They were vertically integrated and followed a *functional* organizational form. Through this, they were able to realize an efficient exploitation of emerging mass production and distribution technologies. Thus, this structure offered a high *fit* with the upcoming new technologies, and therefore this structure was prevalent during the late 19th century.

However, this structure also is highly inflexible when it comes to adding new products or addressing new markets. Therefore, organizations adopting this structure were becoming more and more constrained by their central authority. Furthermore, these centralized functional organization heavily relied on constant growth, so that the recession following World War I posed a severe threat to them. The answer to these problems that pioneering organizations of this time, like General Motors and DuPont, gave was that of a *multidivisional* structure. "In this type of structure, autonomous divisions continued to integrate production and distribution by coordinating flows from suppliers to consumers in different, clearly defined markets" (Chandler, 1977, p. 457). These

[20] Three of these shifts happen within an organization, while the last is exactly the transition to an inter-organizational network structure. As the IS development industry came into existence only a couple of decades ago, it is argued that essentially this last step is most relevant in this context. However, for the sake of completeness the other two shifts are also briefly explained below. However, the focus of this section is on the emerging inter-organizational network structures.

autonomous divisions were guided by an executive management group that - supported by staff committees on the major business functions - decided on policies and strategies. Once the strategy of diversification into multiple fields has been adopted by the majority of corporations during the 1920s and 1930s, the organizational structure of a general office with multiple autonomous divisions became the prevalent structure of large corporations. The reason for this can again be found in the *fit* of the structure with the environment: "It provided a more flexible and efficient organizational alternative (...) than (...) the consolidation of the operations of constituent companies into a single centralized functionally departmentalized structure" (Chandler, 1977, p. 463).

The third shift occurred when organizations tried to combine the two organizational structures discussed in the preceding paragraphs. Organizations trying to achieve the efficiencies of the functional structure without forsaking the effectiveness of multidivisional structure adopted both in parallel. The resulting structure is that of a *matrix* in which "the normal, hierarchical groupings of an organization (usually functional) can be represented by the columns, and the lateral, coordinating ones (often of project, product or business area) by the rows" of this matrix (Knight, 1976, p. 113). This shift towards the presumedly new matrix structure is highly disputed in the literature. Kingdon (1973, p. 5) argues that "it is obvious to anyone who has worked in even the most stringent hierarchy, or bureaucracy, that any organization is really a matrix or mixed model with multiple-channel communication." The matrix is thus only a legitimization of already existing structures. Galbraith (1971, p. 37) argues along the same lines, when he states that there exists a "wide range of alternatives between a pure functional organization and a pure product organization with the matrix being half-way between." Chandler (1977) doubts whether there exists a third shift in organizational structure at all. However, no matter whether the matrix structure is labeled as third shift or not, it has to be argued that this structure has not been very successful. As it necessarily creates a situation of dual authority relationships, it infringes important principles of management (Koontz and O'Donnell, 1964). Both, the principle of *unity of command* and the principle of *parity of authority and responsibility* are not followed (Pitts and Daniels, 1984). Consequently, the matrix structure in practice proved to be almost unmanageable[21] (Chi and Nystrom, 1998; Bartlett and Goshal, 1990).

This leads to the fourth shift in organizational structure, from an integrated matrix towards a *networked* paradigm (Bartlett and Goshal, 1993). In its broadest meaning an organizational network can be defined as a number of actors (of that network), which

[21] Others argue that the advancement of the divisional organization can essentially be found in the concept of *Business Process Reengineering* (this passage is largely based on the critique of the concept in Kieser, 1996). In this concept, the focus is even more on objects (e.g. products), and the business functions (e.g. purchasing) are only supporting the (process) flow of these objects through the organization. However, it is also argued that this focus on objects cannot be continued ad infinitum. These structures soon promise to be just as unmanageable as the here described matrix structure. The result is thus close to the same.

are connected through various ties to each other[22]. In this context, both actors and ties can be of diverse nature. Common examples for actors are (ordered from a macro- to a micro-level) organizations, groups, or individuals. The ties connecting these actors vary according to the chosen level of actors. On an organizational level it might be volume of trade or communication among the organizations. If an individual level is chosen, it might be degree of friendship or physical proximity (Borgatti and Foster, 2003). Consequently, research in organizational networks has blossomed during the last couple of decades - Borgatti and Foster (2003) even recognize an exponential growth. With such a broad definition for organizational networks, these are conceivable both across and within organizations. Following Snow et al. (1992), the main distinction between those two modes of operation is the fact that "the internal-network firm owns most or all of the assets associated with a particular business" (p. 11), while in an inter-organizational network, "assets are owned by several firms" (p. 13). The distinction between the two types of networks is illustrated in Figure 2.5. In this figure, circles depict legally independent organizations, while triangles stand for subunits within an organization.

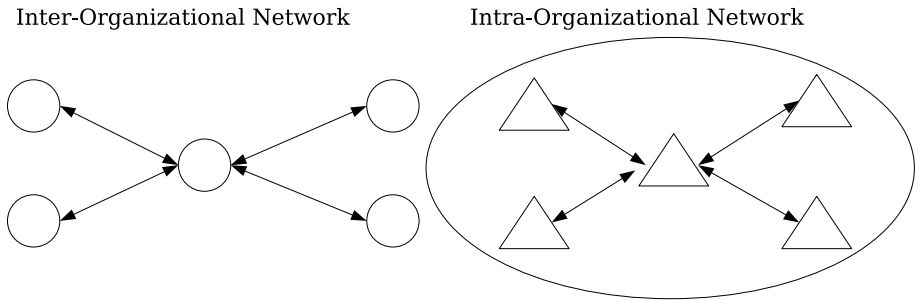

Figure 2.5: Intra- vs. Inter-Organizational Networks.
Source: Based on Snow et al. (1992, p. 12).

While the intra-organizational network does not represent the conceived structure of the IS development industry, the inter-organizational network seems to closely resemble this structure[23]. This inter-organizational network consists, contrary to the organizational structures during the last two centuries sketched above, of organizations that do not incorporate all of the necessary business functions. Rather, organizations specialize in certain, well-defined fields of operation in which they excel, while at the same time

[22] This definition of an organizational network is very broad. It also "includes a wide array of joint ventures, strategic alliances, business groups, franchises, research consortia, relational contracts, and outsourcing agreements" (Podolny and Page, 1998, p. 59). Subsequently the term *network* is used synonymous with these terms.

[23] However, there is a large and growing body of literature on intra-organizational networks, which is in part also useful for shedding more light on the IS development network. Therefore, despite the fact that the focus of this work is clearly on an inter-organizational network, literature of the second type is also included wherever appropriate.

staying legally independent. Because for any given product or service that is produced or provided, several of these fields of operation are needed, organizations have to interact with each other. Through this interaction, several specialized organizations are integrated into larger entities that together can meaningfully address certain products or services. Such an organizational network can be defined as follows: "An organizational network describes the coordinated cooperation between several legally independent and formally autonomous organizations[24]". As the network can be considered a progressional step in the development of organizational structures, the main distinguishing aspect of this type from preceding ones is therefore the *vertical disaggregation* of the ownership structure in the network (Miles and Snow, 1986). Also, as the structure that is addressed in this networked paradigm is traversing organizational boundaries, it is misleading to speak of an *organizational* structure. Rather, this structure is more addressing how an *industry* is organized, thus also closing the loop between addressing an industry change through the organizations involved in this industry.

This vertically disaggregated, inter-organizational nature of networks also has severe ramifications for this organizational/industry structure. First of all, when "properly constructed, the (...) network organization will display the technical expertise of the functional form, the market focus of the divisional form, and the efficient use of resources characteristic of the matrix" (Miles and Snow, 1984, p. 27). At the same time the network organization reintroduce the principles of *unity of command* and *parity of authority and responsibility*. Because the single organizations in the network are legally independent, the head of each organization is the single point of command for this organization. Because organizations specializing in only certain well-defined areas tend to be much smaller than the vertical integrated behemoths of the past century, this unity of command can be enforced without extensive hierarchies, thus not diluting the principle. Furthermore, *parity of authority and responsibility* is also guaranteed. This is the fact because the heads of the organizations are not only fully responsible for their organizations, but they also have far reaching authority in them. Therefore the networked structure promises to overcome the most severe drawbacks of the matrix organization.

Other authors also recognize implications of this distinction between inter- and intra-organizational networks. Sydow (1999) for example develops a framework that is based on the distinction between *hierarchical* and *heterarchical* networks. A hierarchical network refers to one that is characterized by authority relationships that are traditionally found within one organization. The term heterarchy goes back to Gunnar Hedlund (Hedlund, 1986; Hedlund and Rolander, 1990), who - in a nutshell - defines it in the context of a multinational corporation as an organizational structure with many different centers of excellence. In this structure each of these centers is playing a decisive role

[24] This quote is translated from German: "Ein Unternehmensnetzwerk beschreibt die koordinierte Zusammenarbeit zwischen mehreren rechtlich selbstständigen und formal unabhängigen Unternehmen" (Siebert, 1999, p. 9).

for the entire corporation; each is enjoying a high degree of autonomy; and the complex whole is governed through normative control rather than coercion or bureaucracy. This very closely mirrors the ideas of an intra-organizational network[25].

Another aspect that distinguishes different types of networks is how the participants of such a network are interconnected with each other. This dimension has to be considered to be of prime importance for this work. As Van de Ven et al. (p. 20 1979, emphasis in original) note, "the simplest form of [a network] is the *pairwise relationship* between two organizations." However, this simplest form of a network is considered more a building-block for more complex types, and thus serves more as a starting point for a closer examination of more complex organizational structures. In the literature there are essentially two distinct modes of organizational structure in a network. The first structure is that of a completely intermeshed network. This structure is called "all-channel network" by Evan (1966, p. 185), "inter-agency network" by Van de Ven et al. (1979, p. 21), or "coalition" by Provan (1983, p. 83). In this type of network all members are in some way connected to each other. The second organizational structure is that of a central organization with dyadic connections to other member organization of the network. This structure is termed "the wheel" by Evan (1966, p. 185), "interagency set" by Van de Ven et al. (1979, p. 20), or "federation" by Provan (1983, p. 82). The central organization is often referred to as the *hub* (Jarillo, 1988; Kerwood, 1995), the *focal-agency* (Van de Ven et al., 1979, p. 20) or -*organization* (Evan, 1966, p. 185), or the *broker* or *core firm* (Snow et al., 1992, p. 12). For sake of clarity, this work subsequently uses the term *hub* for the central organization, the term *spoke* for the complementing organizations, and consequently the term *hub-and-spoke* network when describing the entire network. These distinct structures are illustrated in Figure 2.6.

Out of these two complex structures that of a *hub-and-spoke* network closely relates to the above discussed structure that is currently emerging in the IS development industry. As is discussed in further detail in the following section, the network is proposed to emerge around existing strong vendors and their systems. This point is also well supported in the literature on organizational networks. As Snow et al. (1992, p. 13) argue, "often, a set of [organizations] is nestled around a large "core" firm." This is especially true if the network is developing information goods. In this context, it can be argued that the *hub* is developing the platform, which includes in the here focused example the general functionalities of a standardized enterprise IS. This platform is then complemented by the *spokes*, which are supposed to develop specific niche functionalities. As has been discussed above, the concept of network externalities indicates that the platform of a central vendor becomes more valuable if more complementary products

[25] Hedlund (1986); Hedlund and Rolander (1990) assumes that the different centers are subsidiaries of *one* organization. Otherwise, the statements on autonomy and bureaucracy would be fruitless. However, as Sydow (1999) has shown, the work of Hedlund (1986); Hedlund and Rolander (1990) is also very useful for studying inter-organizational networks. This is therefore one example of a study on intra-organizational networks used to gain a deeper understanding of inter-organizational networks.

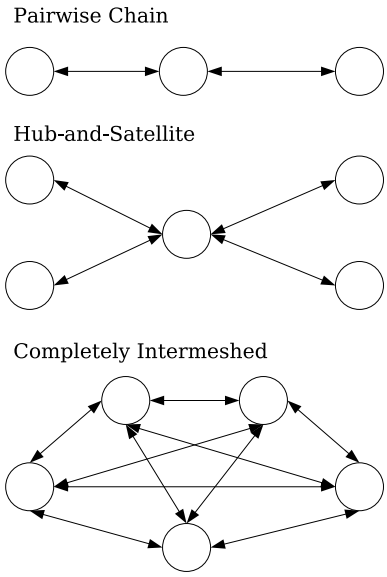

Figure 2.6: Organizational Structures in a Network.
Source: Based on Evan (1966, p. 185) and Van de Ven et al. (1979, p. 21).

exist (Shapiro and Varian, 1999b), and thus the role of the central platform architect is highly attractive in this context (Gawer and Cusumano, 2002; Morris and Ferguson, 1993). This dimension can be considered one of the most important aspects of the organizational structure described here, as it will guide the further research substantially. As it has been already mentioned in the introduction, this distinction between hubs and spokes is assumed to be *the* differentiating factor between the various players in the IS development network. Consequently, the analysis of both reasons for participating as well as approaches to managing within the network that are the key research objectives of this study always distinguish between the role of a hub and that of a spoke in the network.

A very important aspect of this distinction is highlighted by Sydow (1999). As he notes, strategic networks typically encompass a larger, leading organization, which defines "the to be addressed market, the thereto used strategies and technologies, as well as the definition of the network structures, which includes boundary spanning business processes[26]" (p. 286 ff). This encompasses that this larger, central organization has a peculiar interest in its partners' well-being, and thus is expected to assume a certain degree of responsibility for them. As Snow et al. (1992, p. 14) argue in the case of such a network, "in bad times, however, the "parent" firm may have to protect the health

[26] This quote is translated from German: "Die fokale Unternehmung definiert mehr als die anderen am Netzwerk beteiligten den zu bearbeitenden Markt, die dazu heranzuziehenden Strategien und Technologien sowie die Ausgestaltung der Netzwerkorganisation, einschliesslich der über die Grenzen der eigenen Unternehmung hinausreichenden Geschäftsprozesse."

of smaller "family members"." Sydow and Windeler (1998, p. 266) argue in this context that with regard to the loyalty, trust, and social embeddedness that is evolving in inter-organizational networks over time, these closely resemble intra-organizational ones. Galunic and Eisenhardt found in their study on the network in a multi-divisional firm, that besides an economic logic, a social one was also of prime importance in reassigning strategic direction to divisions:

> Indeed, the picture that emerged was one of corporate actors simultaneously and continuously juggling these logics, immersed in both an economic, business-minded reality and a communal, familial world. In the long run, both logics are needed to explain the evolution of this corporation. But, in the short run, juggling the two logics, as managers made judgements about how compelling each logic was for the (...) decision at hand, defined the day-to-day reality (Galunic and Eisenhardt, 2001, p. 1233 ff).

The network is thus exactly not characterized by the arm's length relations that prevail in pure market relations. Rather, it can be considered an organizational structure in-between the extreme poles of markets and hierarchies (Thorelli, 1986; Williamson, 1985), or even as an alternative structure independent of them (Powell, 1990). Regardless of the perspective, the network is thus characterized by a certain degree of stability. Consequently, Sydow (1999) incorporates this dimension into his framework. The resulting two-dimensional matrix is illustrated in Figure 2.7. In this figure Sydow (1999) also sketches four exemplary network types - a regional network, a project network, a virtual enterprise, and a strategic network - which all have distinct characteristics on the two mentioned dimensions.

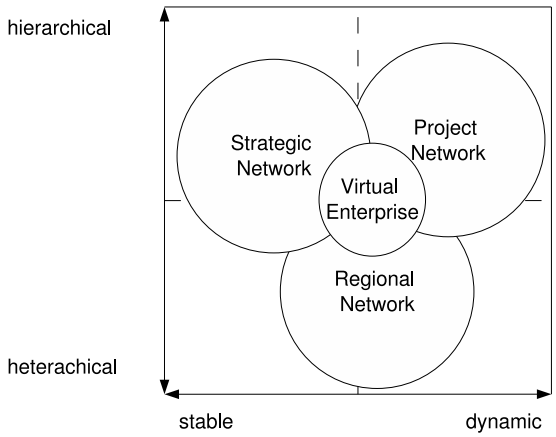

Figure 2.7: A Typology of Inter-Organizational Networks.
Source: Adapted from Sydow (1999, p. 287).

In this framework, the proposed network for the IS development industry can be characterized as being an intermediate form between hierarchy and heterarchy. On the one hand the constituent organizations are legally independent and thus the overall structure tends to fall into the category of heterarchy. On the other hand, since the central vendor is considered to be of magnitudes larger than most of its partners, it is also supposed to have considerable (albeit indirect) authority over the partners, which indicates a hierarchical nature of the network. On the second dimension, the IS development network is proposed to be relatively stable. It is not uncommon for complex IS to be intended to be used for years if not decades (Warren, 1999). As the maintenance of these systems crucially depends on the knowledge of those that developed the system, all participants of such a network have considerable incentives to keep members alive[27].

Consequently, the IS development network can be classified as a *strategic network* in the sense of Sydow (1999). The fact that these types of networks are most prominent in the automobile and microelectronics industries reinforces the above conducted discussion on modular products leading to modular industry structures. This emerging industry structure has been predicted to be the prevalent one in the post-industrialized era. The works of Laubacher et al. (2003), or Miles et al. (2005) develop visions of how such a networked economy can be realized at the more dynamic or more stable end of the spectrum. However, the following discussion uncovers the fact that the IS development industry has - albeit embracing modular structures in their products now for decades (Parnas, 1972) - escaped the organizational change on an industry level that is observable in so many other industries. The following section uses the above discussed idiosyncrasies in order to establish a clearer understanding of the main reasons for this fact. It then addresses the upcoming of Service Oriented Architectures (SOA) as contributing to a potential solution for the problems that inter-organizationally structured IS development industry is currently facing.

2.1.2.4 Towards a Modular Inter-Organizational IS Industry

The reason for the missing inter-organizational cooperation in developing complex IS can be found in the above discussed idiosyncrasies of this process. In principle, such an inter-organizational development process would be feasible, since "the software industry is analogous to other industries because most software today is built from smaller software objects. The software industry differs, however, in that it lacks the ability to confidently swap components in and out of systems" (Voas, 1998, p. 53). Why this

[27] This stability is also mentioned as a key factor in the discussion of the computer (hardware) industry in Silicon Valley, which is also highly dependent on "a network of long-term partnerships with specialized suppliers" (Saxenian, 1996, p. 146). The stability on an organizational level is also mirrored on an individual level. Albeit annual employee turnover rates were as high as 59 percent for small firms (Saxenian, 1996), about 80 percent of electronical engineers that quit their jobs found a new job within the network of firms at Silicon Valley (Angel, 1989).

fact has so far prevented the emergence of a sophisticated inter-organizationally structured IS development industry has essentially two highly interrelated reasons. These are discussed subsequently.

First, it has been and still is very expensive to integrate different parts of an IS that are developed by different organizations. The reason for this lies in the *intellectual* nature of these systems, as it has been discussed in Section 2.1.1.3. As has been stated there, changes to a system are very common. This fact makes a clear - and stable - definition of functional requirements, the subsequent mapping of these requirements to components, and furthermore, the mapping of components to organizations that develop them difficult if not impossible - this at least if there is no central authority that coordinates these tasks. This is well reflected in the fact that today, companies spend enormous resources on integrating their IS that have been developed by independent organizations without a clearly articulated and enforced architecture how these systems are supposed to inter-operate with each other. Serain and Craig (2002, p. 1) report that, on average, 40 percent of a company's information processing budget represent integration costs between these types of systems. Companies and the research community agree that the time and effort needed for the integration of company-wide (standardized) IS, like Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) systems, are already (or still) unsatisfactory extensive if these are not developed in a well concerted way (Lee et al., 2003). Many companies still have large numbers of IS that do not work with standard interfaces. Often, these systems are rather connected through individually designed interfaces in a point-to-point fashion. These systems are difficult to understand and therefore difficult to maintain. This unpredictability of interconnections between systems is also the reason why the metaphor of *spaghetti systems* came up for this type of IS landscapes (Serain and Craig, 2002). In this context it is also worthwhile to mention that other typical business decisions, such as mergers and acquisitions, or the cooperation with partners inside and outside the boundaries of the company continue to driver integration costs up. Consequently, it is expected that in the future integration costs will rather grow than decline (Keller, 2002).

The other point is related to the fact that essentially IS are *experience* goods. The quality of these goods cannot be easily assessed without buying or using them. As has been discussed in Section 2.1.1.3, the easiest way to assess whether an IS component fulfills the requirements is to actually use (i.e. *experience*) the component. Thus, it is almost impossible to ex ante determine the success of a certain IS component. IS success - albeit being frequently studied - has been an elusive concept (DeLone and McLean, 1992). What exactly constitutes a successful IS has not been clearly defined. One of the obvious reasons for this lies in the complex interaction of people, business tasks, and technology that is one of the most basic characteristics of IS. This is also mirrored in such concepts as *information orientation*. This concept bases IS success - defined as "effective information use to improve business performance" - on the three abilities to manage the technology, the information itself, and the behavior of the people (Marchand et al., 2000, 2001). However, even when focusing on business performance, the assessment of impact

is difficult. The so-called IT productivity paradox (Brynjolfsson, 1993) for example discusses the fact that for a long time, spending on technology has not been found to have a clearly measurable impact on productivity. The Nobel Laureate Robert Solow aptly summarized this with his now famous statement that "we see the computer age everywhere except in the productivity statistics" (cited in Brynjolfsson and Hitt, 1998, p. 51). While more recent research thus addressed the opening of the *black box* between IT spending and firm performance and argues for a multi-staged process of how IT creates business value (Dehning and Richardson, 2002; Soh and Markus, 1995; Melville et al., 2004), the bottom line of the discussion is the fact that there is considerable difficulty to assess the impact that a dollar spent on IS has on the business performance even *after* the dollar has been spent (Dedrick et al., 2003).

Now, it can be argued, that taken together these two idiosyncrasies of IS development - the intellectual nature and the fact that IS are experience goods - have so-far prevented the emergence of a component subindustry for IS development: Since the quality of the components that constitute such a system cannot be assessed correctly in advance *and* swapping a component if it proves to be of inferior quality is very expensive, the economically most efficient way to develop such a system is using all components from one supplier. This situation in which all components are supplied by a single vendor is characteristic for the early days of ERP systems (Lee et al., 2003). It also closely resembles the *jack-off-all-trades* strategy through IBM dominated the computer industry during the 1960s and 1970s[28]. However, as the subsequent introduction to Service-Oriented Architectures (SOA) reveals, integration costs can be substantially reduced (Stal, 2002). Therefore, a mixing and matching of components developed by different companies becomes feasible, and thus the window of opportunity for the IS development industry to embrace not only a modularized product architecture, but also a modularized industrial architecture has opened a bit further (Greenbaum, 2003). The impact that this change in the IS development process has for the entire industry as "a potentially interesting opportunity to build continuously changing Information Systems" should not be underestimated (Bello et al., 2002, p. 439).

This development is similar to design of the first modular computer which was initiated by the fact that "in 1959 and 1960, important customers were telling IBM's sales force and top management in no uncertain terms just how unhappy they were with the growing costs of incompatibility" (Baldwin and Clark, 2000, p. 170). Today, most large IS vendors adopt SOA principles, exactly to allow for a better reuse of their own existing system components and meet customer requirements for more flexible and adaptable systems. In this context it is important to note that large IS vendors initially used SOA principles in order to get a better grip on their own, highly complex systems. Consequently, it is no surprise that most of the Web Services that are the basic building blocks of such a structure are not created from scratch, but rather carved out from

[28] See also Figures 2.3 and 2.4 for an illustration of the change that the computer industry in general has been subject to, after the swapping of components became feasible in this area.

existing applications (Holland, 2002). They thus primarily establish flexible interfaces for existing enterprise systems. However, at the same time these SOA principles are also often seen as a means to reduce the integration effort between systems developed by different organizations (Stal, 2002). Thus, the can be considered as key to the emergence of the here envisioned inter-organizationally structured IS development industry.

This is achieved through two distinct means. The first is the fact that SOA is based on a certain technology, Web Services, which is defined through standardized exchange protocols in the industry. Whereas before the emergence of SOA and Web Services, integration has been achieved through individually designed, often proprietary protocols, recently a decisive convergence towards a list of *de facto* standards can be recognized (Kreger, 2003). Such standards are for example SOAP (ambiguities concerning the meaning of this acronym have led to the abandoning of a meaning altogether) as communication protocol, the Web Services Description Language (WSDL) for service description, or Universal Description, Discovery, and Integration (UDDI) for the eponymous tasks. Since specifications for these standards are available freely on the Internet, most have a dominant role in their specific domain. Pulier and Taylor (2006, p. 27) have for example argued that SOAP should be considered as the "lingua franca of web services, the (...) structure on which all web services messages are built." The importance of these standards cannot be underestimated and is also acknowledge here. However, as the focus of this work is exactly not technical, the further discussion of each technical standard is not pursued here. For this work, it suffices to state that through the adoption of SOA a higher degree of standardization is induced in the IS development industry. This standardization is assumed to be a key for the emergence of the inter-organizational structure (see also Section 2.3.3).

The other aspect how Web Services can contribute to reducing integration effort is through their self-describing interfaces. Using Web Services commonly involves three different roles[29]: A service requester is looking for a specific functionality; a service provider is providing this functionality; and a service repository is acting as a central facility in which information about providers and requesters is stored. For a specific Web Service invocation, the typical interaction mode among the three parties can be described as follows: The service requester is searching for a Web Service that is fitting to its requirements in the service repository. The repository provides descriptions of fitting Web Services that are offered by service providers, who previously published those descriptions in the service repository. After the description has been retrieved, the service requester binds the service provider by invoking the service. Since interfaces are defined only when the service is actually searched for, through this approach the problem with changing functionalities and interfaces in a dynamic IS context can be largely avoided. This is illustrated in Figure 2.8.

[29] These roles not necessarily have to represent actual entities. It is very well conceivable that all roles are fulfilled by the same organization, even running on the same computer.

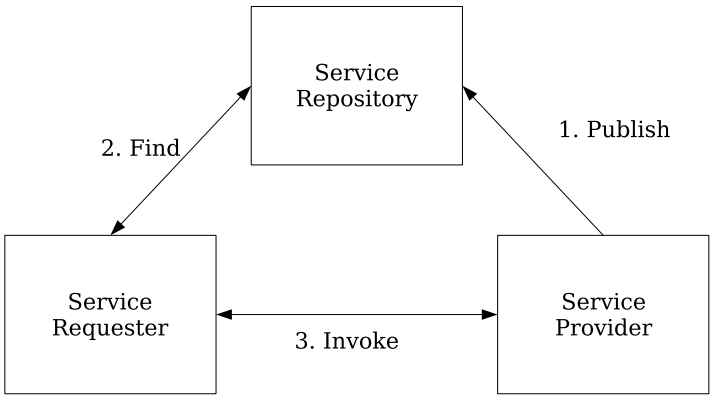

Figure 2.8: Interaction of Service Requester, Repository, and Provider.
Source: Adapted from Messerschmitt and Szyperski (2003, p. 262).

Furthermore, SOA is not limited to the use of any current technology, but rather describes the entire architecture of the software system, emphasizing principles such as the division of systems into small-grained, functional components. Consequently, SOA promises to substantially reduce integration efforts, and thus facilitate the adoption of a truly modularized IS development approach - both on a product and an industry level. Sprott (2000, p. 67) for example argues that this adoption of SOA "creates opportunities for (...) third parties to create clone or extension components providing specific support for functionality that has either general or niche applicability." However, while the principles of inter-organizational, modularized IS development are well represented in the literature, empirical evidence is scant. Messerschmitt and Szyperski (2003) amply discuss real world examples for their theses on the software development industry. However, when it comes to component based development, they only give a hypothetical example. Similarly, Van de Ven (2005, p. 373) argues that "running in packs is often more successful than going it alone to develop knowledge-intensive technologies." However, he also does not provide any empirical evidence. Further, Sprott (2000, p. 67) argues that "the emergence of markets surrounding the core applications, where third-party developers create extension and even clone components provides a wealth of additional functionality." Again, without giving evidence of such a market. Finally, Papazoglou and Georgakopoulos (2003, p. 27) discuss "open service marketplaces" in considerable detail. However, again without giving real-world examples.

Therefore, in this context the present study deliberately not addresses technical issues. Rather organizational aspect of this profound change that the IS development industry is currently undergoing are analyzed. As has already been implicitly assumed throughout the so-far conducted discussion, there are various perspectives on this change process. It has especially been argued that indeed the change that is currently happening is impacting both the entire industry and the organizations that constitute this industry. In

the following section, the perception that both levels of change are inseparably connected with each other is corroborated with a discussion of different perspectives on change and how they are *nested* in each other.

2.1.3 Perspectives on Change

This study is inherently addressing the change that the IS development industry is currently undergoing. Throughout the above conducted discussions a clear distinction between the industry and the organizational level has often been difficult. In order to shed more light on this difficult distinction, in the following potential perspectives on change are discussed. In this context it is argued that the processes that are happening on the industry and those that are happening on the organizational level should not be considered separately of each other. In order to attempt to understand the change that is happening, both levels should be kept in mind; albeit only one has been chosen to guide this research.

Van de Ven and Poole (1995) have established a taxonomy of organizational change processes which consists of four distinct *motors* that drive change. As they argue, these motors can be considered elementary building blocks of organizational change, and "that all specific theories of organizational change and development can be built from one or more of the four basic types" (p. 511). Albeit the fact that Van de Ven and Poole (1995) explicitly base their discussion on change *within* an organization, they also argue for an applicability of the concept for "the development of an industry" (p. 534). Especially in this context of change processes in an industry, it is important to note that processes of change are often "multilayered and complex. Attempts to explain this process with a single motor run the risk of oversimplification and selective attention to one aspect of the change process at the expense of others" (Van de Ven and Poole, 1995, p. 526). Multiple motors that drive a change process are often interlinked through what Van de Ven and Poole (1995) call *nesting*. In this concept, one motor is treated as acting within another one. This concept seems to be highly appropriate in the context of change within an industry that is affecting the organizations that form this industry. As it is argued below, the change in the industry can be analyzed through one perspective, while the organizations are driven by a different, nested motor.

Thus, the so-far described change process can be explained through using two of the motors discussed by Van de Ven and Poole (1995). On an industry level, a *dialectical* change can be observed. Within this general context of dialectical change on an industry level, the various organizations of this industry are proposed to deliberately follow their own agenda. This purposeful action towards a certain goal can be clearly identified as a

teleological motor. Consequently, these two distinct drivers of change are subsequently discussed in the context of IS development. It is important to note, that this selection is a deliberate choice[30].

2.1.3.1 Dialectical Change - An Industry Perspective

In the general meaning of the concept, dialectical theory assumes that an entity (which might for example be an organization or an industry) that is subject to change exists in a complex environment with different conflicting and opposing forces (termed *thesis* and *anti-thesis* in dialectics) that each try to pull the entity into a specific direction (Van de Ven and Poole, 1995). Within this environment stability is achieved by a balance of power between these different forces. This concept of dialectical change is widely applied to explain change within organizations (Benson, 1977). However, considering the context of this study, the entity that is changed is the IS development industry itself rather than a single organization. The generality of the concept of dialectical change, however, allows for such a different scope (Van de Ven and Poole, 1995).

In this context it is a central assumption in dialectical theory that both paradigms engage in conflict. Through this conflict, the old paradigm is replaced - but not entirely - by the new one; rather those parts of the old paradigm that proved to be inferior to the corresponding parts of the new paradigm are replaced. Consequently, those parts that proved to be superior to the corresponding parts of the new paradigm are retained. The emerging paradigm is thus neither the old paradigm, nor the new paradigm, but a *synthesis* of the two. This synthesis is supposed to be superior to both preceding paradigms (Van de Ven and Poole, 1995).

Applying this concept to the history of IS development as it has been discussed in Section 2.1.1.2, can contribute substantially to explain what happened throughout recent years in IS development. In the industry of IS development, the custom made nature of IS that has been dominant during the early days of the industry can be considered the *thesis*. Then, during the late 1960s and early 1970s standardized IS emerged as *antithesis*. Both approaches have distinct advantages and disadvantages that both influence the decision of a potential buyer towards one solution or the other. The today existing balance of standardized and custom made software - which is obviously highly skewed towards the standardized solution - can be considered the outcome of this dialectical struggle. In this context it has been argued that the current trend in the industry goes towards the

[30] Obviously, other perspectives on the change in the IS development industry are also conceivable. For example, especially focusing on the group of smaller partners in the network, it can be argued that they compete for scarce projects (Hannan and Freeman, 1977). In order to successfully acquire these projects, the smaller organizations try to deliberately differentiate themselves from their competitors (Porter, 1996). Depending on how goods they are in aligning their strategy to the environment, they either survive or perish. This very well mirrors the *evolutionary* motor, as discussed by Van de Ven and Poole (1995). Another potential perspective would be to analyze the entire *live-cycle* of a partnership, from its start-up phase to its termination. Thus, all four perspectives given by Van de Ven and Poole (1995) could be fruitfully employed in the here described context.

individual assembling of standardized components. The components are developed in a standardized fashion, thus realizing the advantages of the antithesis. But they are assembled in an individual way, thus realizing the benefits of the thesis. Thus, the new paradigm can indeed be considered a synthesis of the two preceding approaches (Arndt and Dibbern, 2006b).

Consequently, dialectical theory offers valuable insight into the process of changing the software development industry, which warrants a further discussion of the topic. In this context, Benson (1977) mentions three aspects of dialectical change that are of prime relevance. First, he describes dialectical change as *total*. Because change results from existing structures, these structures have to be considered when analyzing change. Structures that emerged through prior change processes are the result of structures that lay even further in the past. Because of this, new emerging structures are intertwined with past structures through a multitude of complex connections. These connections are not always coherent, and are by no means completely understood. Therefore, dialectical change analysis, although focused on unique autonomous phenomena, should never loose sight of the complex whole of the environment. As has been mentioned above, the development towards integrated systems during the last couple of decades plays a dominating role in the context of this study. The large system vendors are proposed to become the hubs of the emerging network, and thus play a pivotal role in the context of this study. They both provide the platform that interconnects the different solutions of the partners and also to some degree act as an authority within the network (Gawer and Cusumano, 2002).

The second aspect of dialectical change, as described by Benson (1977), is *contradiction*. The creation of new ideas as a basis of change results in the upcoming of inconsistencies, ruptures, and incompatibilities with traditional concepts. These contradictions form the basis of dialectical change. New concepts arise that challenge old ideas. They might have emerged from partially autonomous organizations as responses to a changed environment, or as new ideas that appear in society. These contradictions are also one of the key motivating factors for this study. Obviously, the above described new industry structure is contradicting what has been prevalent in the industry before. Therefore, the questions of why this new structure is adopted and how organizations manage within the new structure are addressed.

Finally, Benson (1977) argues that dialectical change is rooted firmly in the context of this change. Therefore, the change process has to be regarded from a perspective that takes into account the goals and interests of different existing stakeholders and their power to defend and enforce their interests. This is closely aligned with the perception of nested motors of change. While the overall industry structure is influenced by a dialectical change, the industry members all follow distinct agendas. These are described subsequently as teleological in nature.

2.1.3.2 Teleological Change - An Organizational Perspective

As it has been argued, while the dialectical perspective can be useful to explain the underlying reasons why the entire IS development industry is changing, it is of little help in understanding the individual organizations that constitute the industry. As this is the main goal of this study, the guiding perspective is a *teleological* one. This perspective of the change processes in the IS development industry is - contrary to the preceding one - not addressing this change through analyzing the entire industry, but rather through analyzing the individual organizations as driving force of this change. As Van de Ven and Poole (1995) argue, this type of change is characterized by three distinct factors.

First, an entity exists that is deliberately pursuing an envisioned goal or end-state. As the discussion on inter-organizational networks above has shown, the distinctive feature of these networks is the fact that independent organizations *voluntarily* cooperate with each other. Thus, since these organizations are not driven into the network by coercion, they can be considered to deliberately pursue a strategy that includes their participation in such a network. It is important to note at this point that this does not indicate *why* organizations participate in the network. This question is addressed in the first research question. At this point in time, it suffices to state that organizations make an independent decision to follow a strategy that is intended to make them either hubs or spokes in the network.

Furthermore, Van de Ven and Poole (1995) argue that the entity that is pursuing the end-state is engaged in some kind of sense and decision making about its environment and a process of determining the desired end-state as a goal. These processes can be engaged in before or after actions are taken, they can be explicit or implicit, the important fact is that there is some type of conscious choice about this. This requirement of an identifiable process of sense making, decision making and goal setting can be easily fulfilled in the organizational setting here depicted. As Daft and Weick (1984) argue, all organizations can be considered interpretation systems in a sense that they permanently engage in the three-staged process of scanning their environment, giving meaning to the obtained data, and acting on the basis of this meaning. Obviously, all organizations differ in how they engage in this process, however, the three basic stages are present in every organization (Daft and Weick, 1984).

The final factor given by Van de Ven and Poole (1995, p. 525) is that "a set of requirements and constraints exist to attain the goal, and the activities and developmental transitions undertaken by the entity contribute to meeting these requirements and constraints." Obviously, the competitive situation in the IS market has severe consequences for organizations acting in this market. The necessity to develop an information system that not only fulfills the technical and functional requirements of the users, but is also accepted in the marketplace has been mentioned as one of the key factors that inhibit

a more dramatic change from traditional IS development towards an IS development network. Consequently, all actors within the market, including the large organizations, are constrained when it comes to attaining the goals they have set for themselves.

In summary it can be stated that the application of the teleological change perspective in this context is highly appropriate. However, as it has been mentioned above and as Machamer (1977) also argues, teleology in itself is not an explanation *why* a certain end-state is envisioned as beneficial for an organization. Rather, teleology only assumes that this envisioned end-state exists, the explanation of why exactly this end-state is aimed at has to originate from a different body of theory. Thus, the next section explicitly discusses theories that address the question why the organizations in the IS development industry form these inter-organizational networks. First a discussion of the concept of an *organization* itself is conducted. What has so far been implicitly assumed is more clearly spelled out. In this context, it is argued that a *strategic* perspective promises to be most insightful in this context. As the most promising theory form this area, the concept of the resource-based view is introduced (Barney, 1991; Penrose, 1959; Wernerfelt, 1984), and subsequently used to distill reasons for pursuing the networked strategy for both, the central vendor and its partners.

2.2 Explaining the Emergence of Inter-Organizational Networks

In his fundamental discussion on what exactly constitutes an organization, Mintzberg (1979b) argues that each organization is indeed a balancing of two conflicting goals. The first is the *division of labor* that becomes necessary once an organization's size exceeds that of a one-man business. As two or more people conjointly work towards a specific goal, there has to be consensus on who is doing what. This consensus is the second aspect of organizations, that of *coordination*, which can be defined simply as "managing dependencies between activities" (Malone and Crowstone, 1994, p. 90). With these two underlying concepts in mind, "the structure of an organization can be defined simply as the sum total of the ways in which it divides its labor into distinct task and then achieves coordination between them" (Mintzberg, 1979b, p. 2). In this context, it has been acknowledged that the division of labor should follow the principles put forth in the discussion on general systems theory (Kast and Rosenzweig, 1972; Scott, 1961). That is, a certain task is best divided into several subtasks in a way that the interdependencies among the subtasks are minimized. However, as Mintzberg (1979b, p. 119 ff) notes, the fact that the division of labor "should be based on (...) interdependencies does not solve the designer's problem. It only raises the difficult question of what those interdependencies are."

Therefore, there has to be another, more fundamental rationale that determines which subtasks are grouped together. This study follows a strategic[31] approach to this problem. In the organizational context of this study, a corporate strategy can be defined as "the pattern of decisions in a company that determines and reveals its objectives, purposes, or goals, produces the principal policies and plans for achieving those goals" Andrews (1987). Simply speaking, strategy is a way to combine means and ends. Thus, a corporate strategy serves the main purpose to identify ways and means to give this corporation an improved competitive situation.

In this context, it can be argued that strategic literature follows one of two distinct paradigms when it comes to explaining promising or successful competitive situations, either focusing on the ends or the means of an organization (Rumelt et al., 1991). The first thread commonly attributes success to industry structure. The probably most influential work in this thread is that of Porter (1980), which is based on the structure-conduct-performance paradigm of industrial organization (Manson, 1949; Bain, 1959). Different characteristics of industries - such as the bargaining power of suppliers and customers, the threat of substitutes and new entrants, or the competition within the industry - make a market more or less attractive. Organizations can realize rents only through exploiting privileged market positions. Contrary to this, the second thread argues that success should be explained by aspects internal to the firm. Especially the resource-based view is based on the argument that the competitive situation of an organization is linked with this organization's unique resources. It therefore complements theories on industry structure. As Penrose (1959, p. 75) notes: "It is the heterogeneity, and not the homogeneity, of the productive services available or potentially available from its resources that gives each firm its unique character." Therefore, the unique resource situation of an organization needs to be considered when discussing when and how organizations succeed or fail. Teece et al. (1997, p. 514) illustrate the difference of these two approaches by defining the sequential steps of the strategy formulation process. From an industry view the steps are the following: "(1) pick an industry (based on its 'structural attractiveness'); (2) choose an entry strategy based on conjectures about competitors' rational strategies; (3) if not already possessed, acquire or otherwise obtain the requisite assets to compete in the market." Contrary to this, the same process from a resource-based view looks as follows: "(1) identify your firm's unique resources; (2) decide in which markets those resources can earn the highest rents; and (3) decide whether the rents from those assets are most effectively utilized by (a) integrating into related market(s), (b) selling the relevant intermediate output to related firms, or (c) selling the assets themselves to a firm in related businesses."

[31] Strategy is defined by the Merriam-Webster Dictionary in a general (political) sense as "the science and art of employing the political, economic, psychological, and military forces of a nation or group of nations to afford the maximum support to adopted policies in peace or war" or as "the science and art of military command exercised to meet the enemy in combat under advantageous conditions."

Since the focus of this work is the industry of IS development, a discussion on basis of an industry perspective cannot be expected to be exceptionally fruitful. Rather then discussing the industry in general, a more detailed analysis of the different resource endowments of the organizations that constitute this industry seems to be appropriate to assess why inter-organizational networks are formed (Currie and Parikh, 2006). This has been readily acknowledged in the literature on network formation, in which this paradigm is prevalent (Oliver and Ebers, 1998; Oliver, 2001; Kogut, 1988; Gulati, 1998; Ireland et al., 2002). Consequently, the subsequent discussion first introduces the theoretical underpinning of this perspective - the resource-based view. Furthermore, several enhancements that the original concept has spawned are also discussed. This addresses first a finer grained perspective on what resources are, and also an explicitly inter-organizational reflection on resources. This discussion is intended to define and clarify the theory used, it is not yet related to the IS development context. This relation is attempted in the following section, in which both an IS and a strategic management perspective on important resources are given. These different perspectives yield three broad categories of resources that are then discussed with special consideration of the IS development context. As it has been argued above, the IS development network is proposed to be of a hub-and-spoke structure. This discussion is therefore following this structure in that it is addressing what resources are brought into the network by these two types of participants. Through this, more light is shed on the first research objective, to answer the question what drives these organizations into adopting this cooperative growth strategy.

2.2.1 Theoretical Perspectives on Organizational Structure

2.2.1.1 The Resource-Based View

As has been already discussed in the introduction to this section, this theory[32] is based on the perception that different firms vary in the resources that they have at their disposal in order to reach a certain goal, and that this specific resource situation can explain certain characteristics of the firm that possesses them. While this seems at first glance to be a decisive break with the prevalent industry structure paradigm, a closer consideration reveals that this is not true. Wernerfelt (1984, p. 171)[33] argues that resources and products of a firm are essentially "two sides of the same coin." While

[32] There is conciderable disagreement whether the resource-based view is actually a *theory* or not. Conner (1991, p. 143) argues "that the resource-based approach is reaching for a theory of the firm." Contrary to this, Priem and Butler (2001, p. 36) state that "the RBV does not presently appear to meet the empirical content criterion required of theoretical systems." While both viewpoints are defendable, Barney (2001) and his perception that the resource based view is valuable and powerful instrument, whether it is a theory or not, is followed in this work.

[33] In 1994 the 1984 article won the prize as one of the most influential papers published in the *Strategic Management Journal* (Wernerfelt, 1995; Priem and Butler, 2001). This supports the above made argument that the concept is very valuable.

industry structure approaches address the product-market side of this coin, the resource-based view explicitly addresses the other. While this idea has first been raised by Penrose in 1959, it received little or almost no attention until the early 1980s.

At that time a body of literature emerged that is concerned with explaining how different resources can contribute to a firm's success. Mahoney and Pandian (1992, p. 369) argue that "the resource-based approach focuses on the key success factors of individual firm behavior to achieve firm-specific advantages." These *key success factors* can be considered to be what has been labeled as the resources of the firm. This already hints towards the very broad definition[34] of what actually a resource is. Wernerfelt defines a resource as follows:

> By a resource is meant anything which could be thought of as a strength or weakness of a given firm. More formally, a firm's resources at a given time could be defined as those (tangible and intangible) assets which are tied semipermanently to the firm (see Caves, 1980). Examples of resources are: brand names, in-house knowledge of technology, employment of skilled personnel, trade contracts, machinery, efficient procedures, capital, etc. (Wernerfelt, 1984, p. 172).

The main question that is now addressed by the resource-based view is therefore, "under what circumstances will a resource lead to high returns over longer periods of time?"[35] (Wernerfelt, 1984, p. 172). The resource-based view, as devised in Barney (1991) answers this question based on two distinct traits of resources. First, it is assumed that resources can be heterogeneously distributed within an industry or any group of firms. Second, it is assumed that these resources can be only imperfectly mobile, i.e. that it is difficult to either *imitate* or *substitute* them. On this basis, Barney (1991) defines a framework for assessing the potential of a resource to be a source of sustained (i.e. long lasting) competitive advantage that is based on four questions[36]:

[34] The fact that resources are defined in such a broad way has raised considerable criticism (see below). However, as it has been mentioned in the introduction, the goal of this research is rather exploratory. In this context the broad nature of the concept promises to be beneficial, as it allows for the unrestricted discovery of significant variables that has been demanded of exploratory studies (Kerlinger and Lee, 2000).

[35] In this context, various terms exist for the here described concept. *Resources*, *assets*, or *competencies* for example are used synonymous in this work. Selznick (1957) has been among the first to use the last term. He labels those competencies that yield a sustained competitive advantage as being *distinctive*. Prahalad and Hamel (1990) pick up the idea of competencies and call them *core* competencies. According to Wernerfelt (1995, p. 171) Prahalad and Hamel (1990) have been "single-handedly responsible for diffusion of the resource-based view into practice." A perception well supported by the fact that on Monday, January, 21st 2008 the article by Prahalad and Hamel (1990) has been cited 692 times in the EBSCO Host database, while the original article by Wernerfelt (1984), published six years earlier, received only 17 citations!

[36] Following the first letters of the attributes, these are also called VRIN attributes (Eisenhardt and Martin, 2000).

- Is a resource valuable?

  Only if the resource that a firm possesses gives the firm the ability to increase either effectiveness, efficiency, or both, this resource qualifies for being a source of sustained competitive advantage. Resources that a firm possesses that are not valuable do not lead to a situation of a competitive advantage for that firm, they might even result in a competitive disadvantage.

- Is a resource rare?

  Only those resources that are heterogeneously distributed among firms qualify for leading to a sustained competitive advantage. In case that a resource is valuable, but homogeneously distributed among actual or potential competitors, the situation a firm is in is called a competitive parity.

- Is a resource inimitable?

  A resource can only lead to a sustained competitive advantage, if this resource cannot be obtained by competitors. A resource that is not possessed by competitors, but can be imitated with time gives the firm that possesses it a temporary competitive advantage: "The observation that valuable and rare organizational resources can be a source of competitive advantage is another way of describing first-mover advantages accruing to firms with resource advantages" (Barney, 1991, p. 107).

- Is a resource non-substitutable?

  This point is closely related to the inimitability of resources. In case that a specific resource that cannot be obtained (imitated), it might be possible to substitute this resource by another (similar or different) one that essentially lead to the same results. Barney (1991) gives the example of a highly qualified top-management team of one firm. While it is obviously impossible for a competitor to obtain exactly this team, this competitor might assemble a similar top-management team that is equally efficient. An example for substituting a resource by a different one is also given by Barney (1991): One firm has a clear vision of its future installed by its charismatic leader, the other by a systematic strategic planning process. The planning process in this example is a different, though substituting resource for the charismatic leader. Only those resources that are not only valuable, rare, and inimitable, but also non-substitutable qualify for leading to a sustained competitive advantage[37].

[37] Note that *sustained* does not mean *forever* in this context. As Barney (1991, p. 103) argues: "That a competitive advantage is sustained does not imply that it will "last forever." It only suggests that it will not be competed away through the duplication efforts of other firms. Unanticipated changes in the economic structure of an industry may make what was, at one time, a source of sustained competitive advantage, no longer valuable for a firm, and thus not a source of any competitive advantage."

Since imitability and substitutability are closely connected in a sense that both enable the competition to acquire an equivalent resource, these two terms are often subsumed under the term of resource *mobility*. The fundamental concepts of the resource-based view can therefore be illustrated in a decision tree as shown in Figure 2.9.

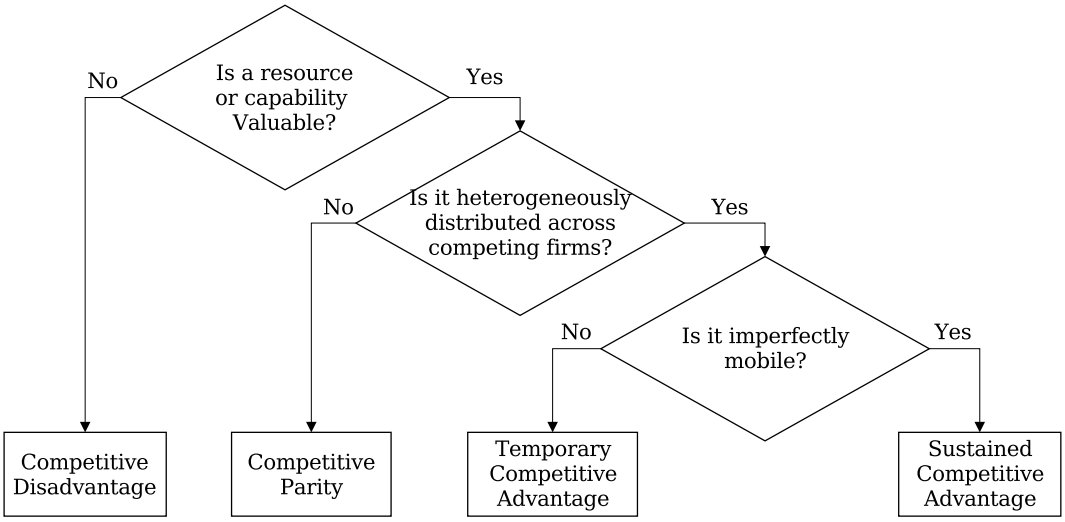

Figure 2.9: A Resource-Based Model of Competitive Advantage.
Source: Mata et al. (1995, p. 494).

The next question that has to be answered is *how* firms come to possess these distinct resources and *why* they cannot be imitated or substituted by competitors?[38] Dierickx and Cool (1989) argue that, since these resources - which they call *strategic assets* - cannot be easily acquired, they have to be *built* by the organization. Usually, this building of assets is achieved through accumulating them over a longer period of time. That is, organizations have to follow certain policies for an extended timeframe to develop a stock of these assets. Since, the "imitability of an asset stock is related to the characteristics of the process by which it may be accumulated," these characteristics are also relevant for preventing competitors from accumulating the same stock of assets (Dierickx and Cool, 1989, p. 1507). Dierickx and Cool (1989) refine this basic idea and discuss five key characteristics that can influence firms in their endeavor to attain these resources.

First, *time compression diseconomies* refer to the fact that acquiring a certain asset or resource simply takes time. Especially intangible resources cannot be obtained through a forced program. Setting up a sophisticated research and development unit for example takes time and cannot be rushed, not even through high investments. Second, *asset mass efficiencies* describe the fact that assets are subject to reinforcing feedback loops.

[38] This distinction between *attaining* and *sustaining* a competitive advantage is hardly found explicitly in the literature on the resource-based view. Exception are Peteraf (1993) and, borrowing from her, Wade and Hulland (2004, p. 115 ff) who characterize resources as leading to *ex ante* or *ex post* "limits to competition."

That is, once a certain critical mass of an asset has been accumulated it becomes easier to accumulate more of that asset. Again, research and development is a good example. A firm that is engaged in basic research often finds it easier to acquire certain applied knowledge. Third, *interconnectedness of asset stock* means that one asset depends upon, one or more, other asset stock(s). A firm that for example has an extensive service network is more apt to take up customers' recommendations and thus being perceived as being responsive to their needs. Fourth, *asset erosion* refers to the converse of time compression diseconomies. Just as it takes time to build up an asset stock, time can also erode this asset if no efforts are made to maintain it. The fact that technological progress quickly makes research and development knowledge obsolete, is an example for asset erosion. Fifth, the fact that asset accumulation is neither deterministic nor continuous is called *causal ambiguity*. It is impossible to per-determine with absolute certainty whether a certain investment will lead to a valuable asset or not. Again, vast sums of research and development spent in, for example, the pharmaceutical industry that only rarely lead to blockbuster products are a good example.

Barney (1991) elaborates on these ideas, and argues that three reasons are responsible for turning a resource into a sustainable competitive advantage: First, the resource has been acquired under *unique historical conditions*, which cannot be reproduced by competitors. Second, referring to *causal ambiguity*, the "link between the resources controlled by a firm and a firm's sustained competitive advantage is not understood or understood only very imperfectly" (p. 109). Finally, the resources might stem from *socially complex phenomena*, which are "beyond the ability of firms to systematically manage and influence" (p. 110).

In summary, the resource-based view offers a good perspective for understanding which of a firm's internal resources can lead to a sustained competitive advantage. However, the concept has also received considerable criticism. Black and Boal (1994, p. 132) for example argue that in the original (as it has been here described) concept, resources are inherently treated as "singular distinct items." That is, either a resource is available to a firm or not. There is no distinct treatment of the inherent dynamics that resources are subject to[39]. This criticism has been addressed as part of the concept of *dynamic capabilities*, which is subsequently introduced.

2.2.1.2 Dynamic Capabilities

Dynamic capabilities are termed *dynamic* as they are those capabilities that are deployed in order to manipulate other resources. Thus, they address exactly the problem of missing dynamic interaction between resources that has been mentioned above. This distinction between *resources* and *capabilities* is well illustrated for example by Helfat and Peteraf, who contrast a capability from a resource as follows:

[39] There are other points of criticism as well. As they reference both the resource-based view and the concept of dynamic capabilities, they are discussed in the following section.

> A resource refers to an asset or input to production (tangible or intangible) that an organization owns, controls, or has access to on a semi-permanent basis. An organizational capability refers to the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result (Helfat and Peteraf, 2003, p. 999).

Although there are subtle nuances in the definitions of other authors, this distinction between resources as more or less basic input factors and capabilities as the ability to use these resources can be recognized in many definitions. Amit and Schoemaker (1993, p. 35) for example differentiate between *resources* "as stocks of available factors that are owned or controlled by the firm" and *capabilities* as "a firm's capacity to deploy *resources*, usually in combination, using organizational processes, to effect a desired end." Similarly, Miller and Shamsie (1996, p. 523) distinguishes between *discrete* resources, that "stand alone and have value more or less independent of their organizational contexts" and *systemic* resources, that "have value because their components are part of a network or system." Winter (2003, p. 991) defines capabilities as "a high level routine (...) for producing significant outputs of a particular type." Finally, Teece et al. (1997), whose work can be considered one of the most influential on the topic, differentiate resources and capabilities even further. While *factors of production* are those input factors that are readily available on the market, *resources* in their terminology are only those that are difficult if not impossible to imitate by competitors. Similarly, *competences* refer to the ability to align factors of production and resources in a way that are meaningful for the organization's business. *Dynamic capabilities* in turn refer to the ability to change these competences in order to react to changed environmental conditions. This focus on evolving processes within a firm has considerable advantages over the 'pure' resource-based view as well as over the enhanced version with resources *and* capabilities. As Teece et al. (1997, p. 529) frame it: "The approach has the benefit of indicating that competitive advantage is not just a function of how one plays the game [capabilities]; it is also a function of the 'assets' one has to play with [resources], and how these assets can be deployed and redeployed in a changing market [dynamic capabilities]."

In this context Teece et al. (1997) argue that especially these dynamic capabilities are sources of sustained competitive advantage for an organization. The reason for this can be easily explained. Up to this point there have been different terms for resources, one of them being *assets*. However, while this term has been used - rather careless one has to say - as a synonym for resources so far, it has to be stated that an asset is defined as the result of capitalization process in accounting. With other words, it is part of an organization's balance sheet. Contrary to this, Teece et al. implicitly argue that capabilities are exactly not part of a balance sheet:

> Indeed, firm capabilities need to be understood not in terms of balance sheet items, but mainly in terms of the organizational structures and managerial processes which support productive activity. By construction, the firm's balance sheet contains items that can be valued, at least at original market prices (cost). It is necessarily the case, therefore, that the balance sheet is a poor shadow of a firm's distinctive competences (Teece et al., 1997, p. 517).

Therefore, dynamic capabilities commonly not appear on the balance sheet of a company. As Hall (1993) has argued, these factors that not appear on the balance sheet are especially important for the future potential of the corresponding company, as they are not easily exchanged. Consequently, these dynamic capabilities as described here are exactly what are providing a company with a potentially sustained competitive advantage. Therefore, they have to be built within the organization, which closes the loop with the above made observation that sources of sustained competitive advantage have to be built through an often long-lasting internal process.

However, while this approach seems to be an intuitively clear enhancement to the resource-based view, it has - similar to the pure RBV - also attracted considerable criticism. Eisenhardt and Martin (2000, p. 1107), albeit defending the concept of dynamic capabilities, summarize the criticism very pointedly in their statement that "dynamic capabilities are often described in vague terms such as 'routines to learn routines' that have been criticized as being tautologic, endlessly recursive, and nonoperational." Picking up the last issue, Priem and Butler (2001, p. 33) argue that anything can be considered as a capability or resource in terms of the here described concepts. Often already existing research is forced into the corset of the resource-based view, simply by labeling the independent variables as resources and the dependent variable as competitive advantage[40].

Addressing the second concern, Collis (1994) states that dynamic capabilities have to be considered a multi-order concept. That is, one can always find a capability that alters other capabilities. This capability is then a source of sustained competitive advantage, until someone finds a higher-order capability which in turn alters the lower-order capability. "It is from here that we advance into the realm of what might be called meta-capabilities. The capability that wins tomorrow is the capability to develop the capability to develop the capability that innovates faster (or better), and so on." Some researchers (Zollo and Winter, 2002, e.g.) already use the work of Collis (1994) on higher-order dynamic capabilities without awareness of the issued warnings. Schreyögg and Kliesch (2005) develop a similar concept of *second order observations*, and argue that this concept is closely related to *double loop learning*, as it has been devised by Argyris and Schön (1978). However, they also do not dwell on the difficulties of an infinite recursion embedded in this concept.

[40] As it has been argued above, this could also be considered an advantage for exploratory studies. As anything can be considered a resource, the goal "to discover significant variables" can be followed unobscured by formal definitions (Kerlinger and Lee, 2000, p. 586).

The problem of dynamic capabilities being tautological is again addressed by Priem and Butler (2001). They argue that the RBV in general suffers from an *In Search of Excellence* Problem[41]. That is, it is always possible to identify valuable resources ex post. Obviously, explaining the success of those firms that possess these valuable resources with the possessing of exactly these resources is tautological.

However, this criticism of the concept of dynamic capabilities is not universally shared in the scientific community. Eisenhardt and Martin (2000, p. 1116) for example argue that "dynamic capabilities are not tautological, vague, and endlessly recursive (...). Rather, they consist of many well-known processes such as alliancing, product development, and strategic decision making that have been studied extensively in their own right, apart from RBV. Their value of competitive advantage lies in their ability to alter the resource base: create, integrate, recombine, and release resources." With other words, there is no need for second- or even higher-order dynamic capabilities. Rather, the ability to dynamically alter the resources that a company possesses is consistent across different contexts. This research promises to yield interesting insights for this dispute. In the context of IS development, it can be argued that the resources themselves are dynamically shifting[42]. Consequently, organizational routines for applying these dynamic resources would in themselves be dynamic capabilities. Therefore, the ability to manage alliancing across organizational boundaries should be a higher-level capability in IS development compared to traditional industries. If this ability proves to be very similar in IS compared to other industries, this would indicate that indeed only one level of dynamic capabilities is needed.

This last paragraph already hinted upon another point of criticism for the resource-based view/dynamic capabilities concept. While the latter extension covers the interaction of resources or capabilities within an organization, interactions across organizational boundaries have so-far not been considered. This has impaired some to criticize the concept in that "the resource based perspective is solely occupied with analysis of the individual firm's bundle of resources (in terms of their ability to contribute to competitive advantage), and has next to nothing to say about inter-firm relations" (Foss, 1999, p. 2). Thus, "ideas of how resources within a firm interact with things both inside and/or outside the firm to create sustainable competitive advantage" are needed (Black and Boal, 1994, p. 133). Interaction with the environment is implicitly included in the resources-based view, as resources that lead to a sustained competitive advantage are exactly those whose value is incorrectly assessed by the environment of the organization that possess them (Barney, 1986), or that are not tradable at all (Dierickx and Cool, 1989). Therefore, possessing these difficult or impossible to trade resources is key

[41] Named after the book by Peters and Waterman (1982), in which the authors research highly successful organizations and identified eight common themes that are, according to the authors, responsible for the enduring success of the studied companies. Obviously, from a scientific perspective it is difficult to determine whether these eight factors are really causing the success of the companies, and have therefore the potential to be causing organizational success also in the future.

[42] See the discussion on continuous innovation in IS development in Section 2.1.1.3.

for being an attractive network partner (Das and Teng, 2000). However, key to the attractiveness for network participation is not only what resources a potential partner possesses, but also how these resources align with those of the other network partners - the topic of the following discussion on inter-organizational resources.

2.2.1.3 Specificities of Inter-Organizational Resources

While the theory so far is without doubt necessary for understanding interactions between companies, its power to explain the formation of inter-organizational networks is limited. Considering such a network from an internal resource-based viewpoint, the main reason that firms have to engage in such relations is to acquire resources which they currently do not possess (Van de Ven, 1976; Eisenhardt and Schoonhoven, 1996). At the same time, firms engaged in such a network have to ensure that their partner(s) do not obtain the resources they bring into the partnership (Das and Teng, 2000; Duschek, 2004). The situation is one that is aptly described by Hamel (1991, p. 84) as a *learning race*: "Failure to 'out-learn' one's partner could render a firm first dependent and then redundant within the partnership, and competitively vulnerable outside it." On this basis, warnings have also been uttered against what is perceived to be a too intense partnering for example by Reich and Mankin (1986) or Hamel et al. (1989).

However, the statement that this acquisition of resources through learning in a network is necessary, because "for some skills, what Itami (1987) terms 'invisible assets,' the cost of internal development may be almost infinite" (Hamel, 1991, p. 99) falls somewhat short of the resource-based theory. As has been discussed above, the sources of sustained competitive advantage are neither imitable, nor substitutable, as it can be argued not even through joint learning in a network. *Sustained* competitive advantages have been defined as those advantages that can "not be competed away through the duplication efforts of other firms" (Barney, 1991, p. 103). That this perception is not unrealistic is confirmed by Das and Teng (2000, p. 40) when they state that "many resources, such as the tacit knowledge of firms, lose much of their value if moved from their current organizational context and other resources used in conjunction."

Thus, resources that are shared in an inter-organizational network should - contrary to the perception of Hamel (1991) - not be *internalized*, but rather *utilized* without internalization (Grunwald and Kieser, 2007). This different focus is aptly described by Grant and Baden-Fuller (2004) in their differentiation between knowledge-*acquiring* and knowledge-*accessing* networks. Describing the shortcomings of the first and advantages of the latter, they argue that "this emphasis on learning - the acquisition of knowledge - fails to recognize the central attribute of the network as an organizational mode that can reconcile the benefits of knowledge specialization with those of flexible integration" (p. 62). Since, as Demsetz (1991) notes, successfully interacting within a multi-firm context always requires the dependence on others, the (internal) resource-based view is obviously not capable of explaining the underlying processes of this cooperation. This, however, already leads over to the next thread of this study - namely how organizational networks

can be successfully managed in order to allow the participants to utilize the resources of others without acquiring them. Through such a management the relationships within the network themselves might become sources of sustained competitive advantage. However, before discussing these issues, first a better understanding of the alignment between resources of the different involved companies is required.

This question of alignment is going beyond considering inter-organizational networks as learning races in a resource-based reflection. Different approaches have been discussed that are intended to explain the fact that many networks rely on combining resources of multiple partners Duschek (2004). This combining of resources without trying to integrate the resources that the partners bring into the relationship is inconceivable in the context of a purely internal resource-based perspective on a network. However, entrepreneurial multi-firm networks are today considered to be "essential to a company's survival and growth" (Miles et al., 2005; Parise and Casher, 2003, p. 25). In this context, Das and Teng (2000) argue for a classification of resource combination based on two dimensions. The distinctive first dimension is whether resources are *similar* or *dissimilar*. The second dimension distinguishes whether resources are actually utilized in the relationship, that is whether they are *performing* or *nonperforming*. The resulting two-by-two matrix (Figure 2.10) gives an overview of the four potential types of resource alignments, which are described subsequently.

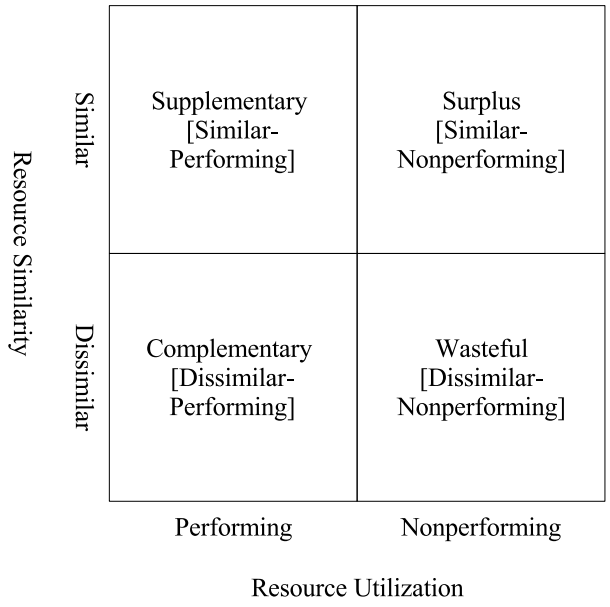

Figure 2.10: A Typology of Inter-Partner Resource Alignments.
Source: Das and Teng (2000, p. 49).

- Supplementary

  The resources that are brought into the inter-organizational network by the different partners are similar and performing. An example for this type of resource alignment might be a joint funding of a common undertaking, or bringing in research and development resources to conjointly address a project of mutual interest. "A supplementary alignment can provide (...) market power, entry deterrence, and economies of scale and scope in such areas as R&D activities, production, and marketing" (Das and Teng, 2000, p. 49).

- Complementary

  The combination of complementary resources in such a network is the most commonly given reason for participating in such organizational networks. The partners in such a relationship all offer distinct resources that the other partners do not possess. Therefore the combination of these resources allows the network to jointly achieve a common goal that would be out of reach for every partner trying to achieve this goal by himself.

- Surplus

  In this setting, the partners provide the network with similar resources that are not fully utilized. While commonly, this would be considered a disadvantageous type of network, Das and Teng (2000, p. 50) argue for a more balanced view on these resources: "As such, surplus is often not a positive resource alignment, as useful resources are not being utilized to their full potential. On the other hand, though, partner firms may deliberately have some surplus in a [network], in order to provide themselves with some cushion against unforeseen adverse conditions."[43]

- Wasteful

  Finally, resources that are brought into a network are not utilized because they are not compatible with the network's needs are wasteful. These resources are simply incompatible with the network.

[43] This cushion is often called organizational *slack* and defined as follows: "Slack consists in payments to members of the coalition in excess of what is required to maintain the organization" (Cyert and March, 1992, p. 42). While this organizational slack stands in sharp contrast to the efficient, lean enterprise that seems to be the current ideal of management literature (Womack and Jones, 1996), it is important to state that Cyert and March (1992) by no means define organizational slack as something negative. Two aspects have to be mentioned: "When the environment becomes less favorable, organizational slack represents a cushion" and "slack provides a source of funds for innovations that would not be approved in the face of scarcity but that have strong subunit support." (Cyert and March, 1992, p. 43 / 189). Other authors also contradict the notion of a *lean* (i.e. one without slack) organization as an efficient one. Karl Weick and his colleagues for example use organizational slack as part of their discussion on avoiding failures in organizations (Weick et al., 1999; Weick and Sutcliff, 2001)

As this discussion has shown, the utilization and not the integration of resources should be considered as the driving force behind network formation. Also, various types of resource alignments between organizations exist that would make a voluntary association of these companies within one network beneficial. The next step in this discussion is a deeper analysis that is substantiating what types of resources an organization actually has to possess[44] in order to be attractive for participating in such a network. This analysis is conducted first from a pure IS perspective. As this limitation proves to be not very fruitful, the analysis is augmented to the disciplines of organizational science and strategic management.

2.2.2 Perspectives on Inter-Organizational Capabilities

After having discussed the underlying foundations of a resource based perspective, this section aims at developing a more precise set of resources or capabilities that companies acting in such an inter-organizationally structured industry are supposed to possess. The accessing of these capabilities is in turn supposed to be the driving force for partnering with this company, and thus for the emergence of the network in the IS development industry. In order to achieve this goal, first capabilities specifically discussed in the IS literature are discussed. However, as knowledge in this field is limited, also a more general discussion of capabilities as driving forces behind network decisions is conducted from the perspective of strategic management and organizational science.

2.2.2.1 The IS Perspective

The resource-based view has been readily applied in the IS context. Especially the work of Mata et al. (1995) is an example of analyzing IS resources through this perspective. They suggest four types of resources that could be a source for sustained competitive advantage in the IS context: *access to capital* needed to develop and apply an IS; *proprietary technology* that can be kept secret or protected otherwise; *technical skills* needed to build and operate a system; or *managerial skills* that are needed to integrate the system with the business goals of the company. According to Mata et al. (1995), out of these four only the last type of resources can be truly considered a source for sustained competitive advantage. Assuming that a company has a good business case, access to capital is rarely an issue today. IS technology is difficult to patent, and even if it can be patented, "workforce mobility, reverse engineering, and formal and informal technical communication all act to reduce the secrecy surrounding proprietary technology" (Mata et al., 1995, p. 497). These factors also act counter to the sustainability of competitive advantage that is derived from technical skills. Especially technical consultants and

[44] These resources by definition have to be internal to that organization. However, as the organization is becoming attractive for other organizations, the inter-organizational resource alignment plays an important role. This duality of internal resource consideration and external resource alignment is also discussed as *inducements* and *opportunities* for network formation by Ahuja (2000).

contractors offer these skills for anyone able to pay for them. Thus, only the ability to successfully integrate a system into the overall business environment can be a source of sustained competitive advantage[45].

This perception that managerial skills are crucial is well supported in the IS literature. In their comprehensive literature review, Wade and Hulland (2004) argue for the sustainability of resources such as the management of *external* and *internal relationships*, the *market responsiveness*, or the ability of *IS planning and change management*. They also argue that factors like *IS infrastructure* or *technical skills* only rarely lead to a sustained competitive advantage. However, in their discussion a profound weakness of IS literature becomes obvious. The field is entirely dedicated to the companies that are *using* these systems. Those companies that *develop* them are completely out of the scope of IS literature. Again, the work of Wade and Hulland (2004, p. 115) well illustrates this fact. The treatment of the factor *IS development* is limited to the statement that "IS development includes capabilities associated with managing a systems development life-cycle that is capable of supporting competitive advantage (Bharadwaj, 2000; Marchand et al., 2000; Ross et al., 1996), and should therefore lead to superior firm performance." Out of the cited works in Wade and Hulland (2004), all also cover user organizations: Bharadwaj (2000) analyze *IT leaders* that have been identified by the journal *Information Week* on the basis of figures like IT budget or IT staff size; Jarvenpaa and Leidner (1998) study a newspaper group in Mexico; Zaheer and Zaheer (1997) focus on financial institutions that are engaged in foreign exchange trading; Marchand et al. (2000) also focus on banks; finally, Ross et al. (1996) do not have a clear industry focus, however they discuss cases from various backgrounds - none of them IS development. The applicability of these studies to the here described context is even more reduced as none of them covers explicitly the inter-organizational interplay of resources owned by different organizations. The concepts of *management of external relationships* and *market responsiveness* discussed in Wade and Hulland (2004) are somewhat hinting into this direction, yet they are not well founded enough to be further analyzed as the driving forces behind the change in the IS development industry.

Approaching the IS literature more from the technical side of its spectrum is also of no help. Albeit the fact that inter-organizational software development - under the label of component based software development (CBSD) - has been widely discussed as a potential solution to the problem of inefficient IS development, both in a technical and an organizational sense, there is no empirical evidence for such a structure. Messerschmitt and Szyperski (2003), Van de Ven (2005), Sprott (2000), and Papazoglou and Georgakopoulos (2003) have already been cited as examples for this shortcoming in Section 2.1.2.4. There are various others: Hong and Lerch (2002, p. 24) argue that "current markets of software components are still in their infancy." Similarly, Jain et al.

[45] This is also well reflected in the discussion on the three-fold nature of IS in Section 2.1.1.1. There the interplay between task, technology, and people has been described as the distinguishing factor of IS. It is also at the heart of the concept of IS alignment, that has been mentioned in Section 2.1.1.3.

(2003, p. 60) state that "CBSD is in its infancy." Sugumaran and Storey (2003, p. 14) recognize that "the reuse repository contains the predefined objects (components) of an application domain." However, there is no further explanation who exactly is supposed to develop these components. Similarly, Hopkins (2000, p. 28) mentions several premises for a successful CBSD approach. The first being, "that there exist components to reuse. There must be a ready supply of well-built, applicable components that can be discovered, licensed, and easily used." He realizes that there are several issues that slow down the development of a marketplace, yet he states that "it is logical to conclude a market for components would develop" (p. 30). However, there are no research efforts that address exactly this problem, namely to analyze the development of a modular subindustry structure for IS components development. Even standard textbooks on the topic are not filling this gap. Szyperski et al. (2002, p. 18) phrases it as follows: "How can markets be created? A full answer to this question is far beyond the scope of this book." Yet, an answer to this question seems to be exactly what is missing currently. This answer might also rebut Glass (1998, p. 59), who commented on modularized IS development with the not too optimistic words: "All too often our field pins its hopes on some breakthrough technology that, in the end, turns out to be BS[46]."

Thus, the topic that this study is addressing a weak spot in the IS literature in a twofold sense. Coming more from an organizational perspective, the field has readily acknowledge the importance of IS for inter-organizational cooperation. However, taking these issues into the domain of IS development on a deeper than superficial level has so far not happened. There is no empirical analysis of inter-organizational cooperation in the field of IS development. Technically this emerging structure has already been anticipated. Many of the more technically oriented studies develop sophisticated ways and means for inter-organizational, modular IS development - just to stop right before analyzing the practical feasibility of such an approach. This study is attempting to close this gap, and thus in part fulfilling the demand of Currie and Parikh (2006, p. 524) "that, rather than restricting our analysis to the technical imperatives of Web services, a more fruitful approach is to relate our discussion to the strategic management literature." The next section therefore discusses reasons why organizations enter into inter-organizational networks from a general strategic managerial perspective. At the end of this chapter, these are then further elaborated on under special consideration of the IS development context and finally translated into propositions on factors that drive large IS vendors into such structures, which in turn are empirically tested in the following chapters.

[46] Please note here, that this work explicitly does *not* assume that IS components are traded over an anonymous market. Rather, IS are developed through *networks* of associated organizations. See Section 2.1.2.

2.2.2.2 The Strategic Management Perspective

It has already been argued that the most appropriate theoretical lens for studying the formation of inter-organizational networks in a specific industry is the resource-based view and its derivatives (Oliver and Ebers, 1998). The discussion on these theoretical backgrounds has in part already implied that the resources that are apt to make an organization an interesting network partner are those that are a source of sustained competitive advantage for those firms (Das and Teng, 2000). Therefore, these resources have to be valuable, heterogeneously distributed, and imperfectly mobile (Barney, 1991; Dierickx and Cool, 1989; Wernerfelt, 1984). In the inter-organizational context the resources that different partners bring into the network have furthermore to fit to each other in that they have to be complementary, supplementary, or surplus to each other (Das and Teng, 2000; Eisenhardt and Schoonhoven, 1996). As the discussion above has also indicated it can be expected that especially dynamic capabilities are likely to fall into this category (Eisenhardt and Martin, 2000; Sanchez and Mahoney, 2001; Teece et al., 1997). However, the literature from a strict IS background does not provide a comprehensive list of potential capabilities that fit into this framework - perhaps expect the broad statement that it is more likely for *managerial* than for *technical* capabilities to be a source of sustained competitive advantage, and that financial leeway is usually not a source of sustained competitive advantage (Mata et al., 1995; Miller and Shamsie, 1996). As the literature in the field of strategic management has amply addressed this issue, it is here used as a reference discipline to develop more concrete propositions in the IS development context (Keen, 1980).

In this context it is important to recall the perspective of this part of the study. It is addressing the first research objective to understand what kinds of resources the various participants possess or lack in order to make the joining of such a network attractive (Ahuja, 2000). Therefore, the subsequently developed capabilities are those that the different partners bring into the network. In this context, Stuart (2000, p. 793) "argue[s] that because networks are formed to achieve access to partner-specific resources, the benefit gained from a portfolio of network relationships is determined in part by attributes of the partner firms that make up the portfolio." As the organizational network as it has been discussed in Section 2.1.2.3 can be considered a hub-and-spoke network, the obvious differentiation between different participants in this network is that between hubs and spokes. In other words, the research question might be re-phrased as what types of resources do hubs possess and spokes lack, and what types of resources do spokes possess and hubs lack that makes the formation of such a network potentially successful for both? The network is in this regard only *potentially* successful, as the other part of network success has to be considered the management of the inter-organizational linkages, which is discussed in the next section (Powell et al., 1996; Dyer and Singh, 1998).

A promising first step in this process of identifying relevant motives for the involved parties is the highly influential[47] review written by Hagedoorn (1993). In this review of more than thirty of the most relevant works on the topic and the subsequent analysis of more than 4,000 alliances, it is concluded that out of the large number of potential motives for network formation, essentially three basic categories can be distilled: Innovation-, technology-, and market-related motives. In the following, these are briefly described, befor the next section discusses them in more detail and with special consideration of the context of a networked IS development industry.

As the first factor in this list, innovation aspects have been found to be of prime importance of network formation (Freeman, 1991; Hagedoorn, 1995). Here especially, the hub-and-spoke structure of networks has been found to be very beneficial for an increased rate of innovation. Miles et al. (2005, p. 46) aptly summarized this perception, when they state that "large firms need the technology developed by small firms, and small firms need the financial muscle and distribution power of the large firms." Powell et al. (1996) support this view with their study in the biotechnology industry. Biotech firms, which are often small start-ups, act as sources of innovations for large, established pharmaceutical companies. These two types of organizations have established a successful and enduring relationship of mutual benefit: "Biotech firms have not supplanted pharmaceutical companies, and large pharmaceuticals have not absorbed the biotechnology field" (Powell, 1998, p. 233). The fact that this type of relationship is transferable into other industries has been acknowledged by Powell et al.:

> These conditions are not limited to biotechnology. In fields as diverse as ceramics and *software*, much of the relevant know-how is neither located inside an organization nor readily available for purchase. When the sources of knowledge are disparate and the pathways to technological development unchartered, we would expect the emergence of networks of learning (p. 143 Powell et al., 1996, emphasis added).

Stuart (2000) supports this idea with his in depth analysis of the semiconductor industry. Here, innovativeness of partner firms has also been found to be one of the drivers of network success. The second factor out of this list, the access to technology, has often been given as *the* prime motive for network formation. The rationale behind this argument is multifaceted. First, as the discussion on modular product architectures in Section 2.1.2.2 has indicated, increased complexity of modern technologies necessitates the specialization on core competencies (Prahalad and Hamel, 1990). As products (or services) have become so complex that a single organization cannot address the entire scope of their production (or provisioning), the consolidation of complementary, supplementary, or surplus resources becomes a necessity. In this context, it has been shown that especially in highly competitive markets, such as IS development, gaining access

[47] On Monday, January 21st, 2008 the paper has been cited well over 200 times in the EBSCO Host database.

to third party technologies has been found to be a crucial factor for network formation (Eisenhardt and Schoonhoven, 1996). The discussion on the concept of *platform architecture* in Section 2.1.2 has also already hinted upon the reason why the hub-and-spoke structure promises to be most efficient for this type of system development. The development of the platform is a very extensive task, which requires the definition of the entire architecture and the provisioning of the core functionality. Consequently, this task is best addressed by the large hub. Contrary to this, highly specialized functionalities that are often confined to certain well defined fields can be better addressed by smaller, also highly specialized entities - the spokes.

Furthermore, these spokes also able to address markets that the hub could not address on its own. Therefore, these inter-organizational networks can be used by their participants to generate additional revenues through gaining access to new markets (Ohmae, 1989). This point has been repeatedly been brought forward in the literature. Hagedoorn (1993) for example mentions the telecommunications industry, in which until recently national markets have been protected by domestic monopolies. Accessing these markets has thus only been feasible through partnering with these domestic organizations. Similarly, Stuart (2000) analyzes the semiconductor industry, in which accessing markets that are often based on proprietary technologies is only possible through partnering with the organization controlling this technology. The idea that accessing foreign (country) markets is best achieved through networks has also been discussed by Glaister and Buckley (1996, p. 314). In their study of UK-based partners of international networks they found that networks "are seen primarily as a means of gaining a significant presence in a new market, enabling faster entry to the market and achieving greater international market penetration." Finally, Spekman et al. (1998, p. 749) in their review of more than twenty studies on network formation found that networks "focus on accessing and creating markets." Here again the hub-and-spoke structure promises to be beneficial. The hub generates momentum through the experiences made in various markets, while the spokes are dedicated to channel this momentum into the specific market that they have specific access to.

So, the discussion of inter-organizational networks from a strategic management perspective has been more fruitful in that it serves as a basis for the here developed three distinct factors that have been found to be of prime importance for network formation. However, these factors are so far very general and thus only partially applicable to the IS development context. This weakness of such a general approach to this issue has also been well reflected in the literature. Stuart for example argues that

> of course, the most important domains for determining competitive success will vary considerable across contexts. In consumer products industries such as packaged foods and over-the-counter medicines, key resources and skills may be, respectively, brand names and consumer marketing capabilities. In

> contrast, in high-technology industries they are likely to be state-of-the-art manufacturing facilities and a leading R&D organization (Stuart, 2000, p. 793).

Thus, the subsequent section is attempting to fill these three broad categories of motives for network formation with content from the IS development context. Based on this discussion, propositions are developed for each of the three categories. These propositions are reflecting the so-far conducted theoretical considerations on exactly what factors are of prime relevance for the formation of the IS development network. The following chapters are then dedicated to empirically testing these propositions.

2.2.3 Proposed Benefits of Inter-Organizational IS Development Networks

In order to answer the first research question of why IS development companies are adopting a cooperative growth strategy through inter-organizational networks, it has been argued that firms are only inclined to enter into these networks if they are in one way or another able to create value for the participants (Teng, 2003). Three broad categories of resource or capabilities have been identified as potential sources of value. These benefits are subsequently discussed in the special light of the IS development context. Obviously, these categories are not completely independent of each other. Rather, each factor seems to be influencing the others and thus a clear-cut differentiation is not (yet) possible[48]. The theoretical argument discussed above has been, that developing IS through an inter-organizational network can be beneficial as it allows for an integration of resources that are available to the hubs but not the spokes and vice versa. At the outset, different degrees and areas of innovativeness of hubs and spokes are discussed as a potential source of benefits of the networked paradigm. It is then argued, that parallel to this difference in innovativeness, the integration can be beneficial if hubs and spokes develop solutions that are either complementary or supplementary to those developed by the other. Thus, the second part gives a discussion of the different technological bases that hubs and spokes have. This difference is the reason for another broad category of benefits. The final section then addresses the difference in market-impact and -access that hubs and spokes have and how this translates into a potentially beneficial conjoint approach.

2.2.3.1 Innovation Benefits

The first mentioned aspect has been a difference in the innovativeness of hub and spoke companies. In this context, innovation has to be considered one of the most important productive resources in society. It is identified as one - if not *the* - main source of

[48] As it has been argued, this is an exploratory study. This type of research in fact has the explicit goal "to discover significant variables (...), to discover relations among variables, and to lay the groundwork for later, more systematic and rigorous testing of hypotheses" Kerlinger and Lee (2000, p. 586).

competitive advantage, not only of organizations but also of entire national economies (Florida, 2004). But what exactly constitutes an innovation? Garcia and Calantone (2002, p. 112) define an innovation as "an iterative process initiated by the perception of a new market and/or service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of this invention." This definition includes two very important aspects of innovation. First, the fact that a new *invention* is developed, and second, that this invention is commercially exploited[49]. The requirement of commercial exploitation turns inventions into innovations. An invention that never leaves the laboratory cannot be classified as an innovation in this context.

It has been discussed as one of the idiosyncrasies of IS, that they are subject to continuous innovations. Thus, the impact of innovation on a discipline like IS is enormous (Denning, 2004), especially since in a competitive and dynamic situation product innovation is crucial for the survival of organizations (Eisenhardt and Martin, 2000). At the same time, it has been found that those organizations that emphasize innovations as core part of their strategy are also more inclined to enter into inter-organizational networks (Eisenhardt and Schoonhoven, 1996). Thus, the innovativeness of the IS development industry can be considered a driving force behind the emergence of a network structure in this context. However, while it is evident that innovation is crucial in a dynamic environment such as IS development, at first glance, there seems to be no reason to assume that innovation that is occurring across organizational boundaries is any better than that within a single organization. Yet, as the discussion above has shown, many networks are explicitly crafted as research and development networks (see for example Powell et al., 1996; Powell, 1998, for the field of biotechnology). This is especially true in dynamic environments: "Innovation-focused alliances are regularly created to share research and development resources, particularly in fast-moving industries such as (...) computer software" (Miles et al., 2005, p. 27).

In this context the finding of Dasgupta and Stiglitz (1980) is highly important, that there is no clear causal relationship between the structure of an industry and the innovative activities within this industry. However, they also note that the innovativeness of an industry "is not a case of a single firm making a single decision (e.g. the total volume of R & D expenditure), but rather a case in which several firms make a complex of decisions" (Dasgupta and Stiglitz, 1980, p. 267). Consequently, the organizational hub-and-spoke structure of the industry has to be broken down into a hub-and-spoke structure of innovations in order to warrant the perception that this structure is more innovative than the integrated on of the past. In the context of a modularized product setting, Henderson and Clark (1990) argue for a consideration of innovations on both a component-level, but also on an architectural level. While the first are confined within

[49] This definition for innovation is going back to Schumpeter (1926, p. 100), who defines economic development in general as the "implementation of new combinations." (This quote is translated from German: "Form und Inhalt der Entwicklung in unserem Sinn ist dann gegeben durch die Definition: Durchsetzung neuer Kombinationen."

the boundaries of one module and do not affect others, the latter are affecting only the overall structure of the system without necessarily affecting the internal workings of a module. Obviously both kinds of innovation can occur at the same time, overthrowing the system's general architecture and the inner workings of its parts, Henderson and Clark (1990) label these innovations as *radical*. Figure 2.11 illustrates the different types of innovations[50].

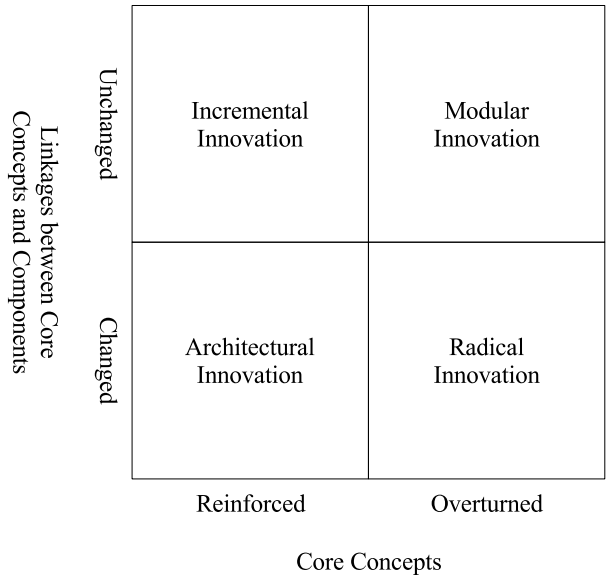

Figure 2.11: A Framework for Defining Innovations.
Source: Adapted from Henderson and Clark (1990).

In this context, it can be assumed that it is the responsibility of the spokes to engage in innovations on the top half of this matrix. The implicit perception that has so-far guided the discussion on different benefits for hubs and spokes has been the fact that organizations are better able to excel in closely defined areas of expertise than if they have to engage in very diverse endeavors (see Section 2.1.2.3). Therefore, the ongoing *modular* innovativeness of spokes improves the overall system through improving its components. The reason, why the spokes are assumed to be better able to innovate their components can be seen in the different size of these two types of organizations in the network. Powell (1998) for example argues that in biotechnology big pharmaceutical companies are often financing small biotech companies, mostly even start-ups or university spin-offs. As it has been argued in Section 2.1.2.4, the emerging network in IS development

[50] Please be advised of the cautioning note of Henderson and Clark (1990, p. 13) that "the distinctions between radical, incremental, and architectural innovations are matters of degree. The intention here is not to defend the boundaries of a particular definition (...). The matrix in [Figure 2.11] is designed to suggest that a given innovation may be less radical or more architectural, not to suggest that the world can be neatly divided into four quadrants."

is largely following along the same lines. It is based on existing systems of large vendors that are selectively and deliberately expanded by solutions developed by smaller, highly specialized partners. Answering the question why this structure is especially suited to pursue innovation goals, it can be argued that this setup is combining the advantages of both large vendors and small complementers. The reason why smaller firms are able to innovate at a higher pace can be seen in the *entrepreneurial* potential of these smaller complementers that large vendors can tap into[51].

Entrepreneurship and innovation are closely intertwined. Drucker (1994, p. 27) argues that "innovation is the specific instrument of entrepreneurship." In a similar vein, Baumol (2002) states that entrepreneurship is a necessary prerequisite for innovation[52]. This perception is based on the definition that Baumol (2002, p. 57) gives for an entrepreneur, namely that of a "bold and imaginative deviator from established business patterns and practices, who constantly seeks the opportunity to introduce new products and new procedures, to invade new markets, and to create new organizational forms." However, as Baumol (2002) also argues, there is no inevitable connection between entrepreneurial spirit and innovation. As entrepreneurs are profit-seeking individuals, it can be expected that they - if facing adverse conditions in an industry - turn their attention to other fields in which circumstances are better. Another option is that potential entrepreneurs simply suppress their striving for independence and work as regular employees in a regular company. Among these adverse conditions is exactly the lack of well defined responsibilities, clear accountability, and maximum degrees of freedom to execute that have been described in Section 2.1.2.3 as part of large organizations. In contrast, these are supposed to be present in the smaller organizations in the IS devel-

[51] This, at first glance, seems to contradict common knowledge on the relationship between innovativeness and size of organizations given in one of the most influential books on the topic: "The size of an organization has consistently been found to be positively related to its innovativeness" (Rogers, 2003, p. 409). However, the term *innovation* is slightly missleading in this quote, as it refers to the adoption of innovations. The development of innovations, on the contrary, is easier in smaller structures, as the example of *skunkworks* shows: "Evidence that the usual bureaucratic structure of an organization is not very conductive to creating technological innovation is provided by the important role of skunkworks, the small and often subversive units within a larger organization that are created in order to pioneer the development of a technological innovation. A *skunkworks* is an especially enriched environment that is intended to help a small group of individuals design a new idea by escaping routine organizational procedures. The R&D workers in a skunkworks are usually highly selected, given special resources, and work on a crash basis to create an innovation" (Rogers, 2003, p. 149). In the present context, it can thus be assumed that the spokes act as a type of "external skunkworks."

[52] The work of Baumol (2002) on innovation as driving force for economic growth closely mirrors other aspects of this study. The following three (of his five) prerequisites for a successful economic development are of prime relevance: "Oligopolistic competition among large, high-tech business firms, with *innovation as a prime competitive weapon*, ensuring continued innovative activities and, very plausibly, their growth" (p. 4); "productive entrepreneurship encouraged by incentives for entrepreneurs to devote themselves to *productive* innovation" (p. 5); and "technology selling and trading, in other words, firms' voluntary pursuit of opportunities for profitable dissemination of innovations" (p. 5, emphasis in original).

opment network. Thus, this organizational form promises to stimulate entrepreneurial spirit to maximum performance. This perception is also shared by Miles et al. (2005), who argue that creating value through innovation, is best achieved by tapping into the entrepreneurial potential of a network of self-managed firms[53].

Interestingly, the increased innovativeness is also mentioned by Gawer and Cusumano (2002, p. 45) as one of the key arguments for embracing the concept of platform architecture: "Many more innovations could emerge from a computer industry organized in layers of specialized firms that created products able to interact through "open" interfaces." In their case study of Intel, they describe how this company explicitly supports small start-ups - which are called *rabbits* by Intel - through their venture capital arm in order to stimulate innovation. Intel also reserves the right to support multiple start-ups in one specific field. The increased level of competition even further stimulates innovativeness of the complementers. Thus, from a resource-based view[54], it can be argued that the innovative entrepreneurial spirit that prevails in the smaller complementing organizations is caused to a considerable extent by the environment in these organizations. This especially since IS development is a very people centric industry, in which not many tasks can be automated (Pfeffer, 1994). Also, the relation of how the environment is influencing the innovativeness of an organization is subject to severe causal ambiguity. Therefore, the large hubs are unable to imitate or substitute this environment, and thus have to leverage the increased innovativeness of their smaller partners through the reliance on inter-organizational networks.

In the context of IS development, another point can be assumed to be especially distinct, since it promises to solve one of the critical pain-points of current systems developers. Referring to ERP systems, Bingi et al. (1999, p. 8) argue that these systems are "so complex and vast that it takes several years and millions of dollars to roll [them] out." Obviously, it is a crucial factor for a fast-paced industry that works on developing more and even more innovations at ever increasing speed to put these innovations to a productive use at the customer. A goal that is not always achieved satisfactory - as the current discussion on *legacy* systems shows. These systems are commonly referred to as those that are used for a very long time - often much longer than has initially been anticipated. Because of business or technical restrictions these systems often have not been designed to accommodate far reaching changes. Furthermore, due to functionality that is added to the system, its complexity is constantly increasing, so that

[53] The innovativeness especially in developing high-tech is, however, also restrained by the institutional environment. Only if "firms have legal rights to make, use, or sell technologies," innovativeness can bloom (Ziedonis, 2004). With other words, only if the *property rights* to the technology are clearly resolved, unconstrained innovativeness will happen. These issues are addressed in the following section on managerial issues in the network.

[54] The notion that this proposition is motivated solely from the resource-based view is not correct. As the main proponent of Transaction Cost Theory, Williamson (1985) explicitly mentions innovation as a limit of what large, integrated firms can achieve. He furthermore argues for a *hybrid* mode - such as an organizational network - for "joining large and small firms in the innovation process" (p. 158).

maintenance costs are ever increasing, too (Seacord et al., 2003). However, the inherent business knowledge in these systems makes them indispensable, so that organizations often deliberately accept these high maintenance costs, or other adverse effect like obsolete hardware, or a large backlog in change requests, rather than switching to another system (Warren, 1999).

The so-far discussion in this section has shown that the capability of fast-paced innovations is crucial in the IS development field. As has been noted, constant innovation is one of the defining characteristics of IS development. It has also been noted that a faster development is also at the heart of modular product development (see Section 2.1.2.2). Thus, one of the crucial reasons for adopting an inter-organizational IS development process is the fact that the systems can be deployed faster in this fashion (Takeuchi and Nonaka, 1986). This aspect is addressed in Brooks (1982) and his discussion of very large software development projects. As has been identified there, the ability to reduce the time to market of software projects crucially depends on the partitioning of the project into subtasks. While this issue has been a prime inhibitor for such a development style in past projects, this is exactly addressed by SOA (see Section 2.1.2.4). The main system is provided by the large vendor and additional components are supplied by smaller partners. As the involved parties are able to work on their specific solution (main system or additional component) in parallel, those IS that are designed through such a cooperative network promise to develop faster than those designed in a monolithic fashion. This reduction of the time to market for the additional components is especially distinct, when the main system has already been introduced[55].

This perception is based to a large extent on the discussion of the advantages of loosely coupled systems (see Section 2.1.2.1). Monolithic systems have to be replaced in an all-or-nothing approach. Due to its high degree of internal integration, it is impossible to simply update or replace parts of the system. This is also one of the prime reasons why so many legacy systems are still used today. There is simply no one willing to tackle the costs and risks of replacing an entire system, one that is successfully running for decades besides that. Contrary to this, a modular IS can be acquired and assembled, or updated and replaced in a step-wise fashion (Kumar and van Hillegersberg, 2000). Since interfaces are dynamically created, components can be added or replaced without significant impact on the rest of the system. Thus, innovations that have been developed by complementers (see above) do not have to be held back until an update to the overall system can be made (Sanchez and Mahoney, 2001, p. 161). Furthermore, teams of specialists can work independently of each other on these loosely coupled projects, and thus apply their distinct competencies where they are needed most. This results in multiple smaller update projects that can be executed in parallel whenever necessary. Therefore the following proposition relating to the hubs objective to leverage the (modular) innovative potential of spokes is suggested:

[55] As the resource-based discussion above has shown, it has to be assumed that the initial deployment of the platform is still a rather large, complex, and therefore long-term project.

Proposition I_H. Large IS producers (hubs) are partnering with smaller software producers (spokes) in order to gain access to their capability both to develop and to deploy modular innovations.

In contrast to the spokes, whose responsibility has been defined as the upper half of the matrix illustrated in Figure 2.11, it can be assumed that it is the responsibility of the hubs to engage in innovations on the bottom half of the matrix[56]. For this reason, which are similar to those mentioned as technical benefits for providing the system, it can be assumed that these architectural innovations are best addressed by the hubs. This especially since these innovations are, contrary to those of the spokes, not confined to narrowly circumscribed components. Therefore, these also require the holistic view on the entire system - this time even going explicitly beyond the boundaries of what is developed by the hub. In this context, it is argued that especially hub organizations have this holistic perspective on the entire system. This perspective is - according to the resource-based view - again difficult to build (e.g. through mass efficiencies or interconnectedness of the involved knowledge). Consequently, the second proposition of this part of the study is addressing the objective of the spokes to utilize the (architectural) innovative potential of the spokes:

Proposition I_S. Small software producers (spokes) are partnering with large IS producers (hubs) in order to gain access to their capability both to develop and to deploy architectural innovations.

However, as it has been discussed as an idiosyncrasy of IS development (see Section 2.1.1.3), constant innovation is occurring parallel at the architectural and the component level. Thus, the overall situation of the IS development industry can be characterized as being subject to radical innovation. However, the specificity of this radical innovation in its here described context is its inter-organizational nature. Rather than being confined to a single organization, innovations depend on each other in order to realize their full potential. Historically, many periods of fast-paced technical progress can be explained through such a process of collective innovation across the boundaries of single firms. The discussion by Allen (1983) on the nineteenth-century steel industry in England can be considered one early example. However there are also more recent ones. For example, Tushman and Anderson (1986) discuss the cement, microcomputer and glass industries and Powell (1998) again focuses on biotechnology. All these studies conclude that interfirm cooperation - often through informal ties between specialists in the industry - contributes to an accelerated overall development of the industry.

[56] Obviously hubs also constantly have to innovate the basic functionalities that their existing system provides. For examples legislative changes require a constant updating of the modules that represent the core business functions in the enterprise IS. Thus, they are also engaged in incremental innovation to a considerable extent.

This has been the discussion on different types of innovativeness as a key capability of hubs and spokes in the inter-organizationally structured IS development industry. Parallel to this innovativeness, other aspects have been identified as being of prime importance for the emergence of such a structure. The next section addresses access to different technologies as one of them.

2.2.3.2 Technology Benefits

The argument that an increased specialization leads to a higher quality of the produced system stems right from the heart of the resource-based view. However, before understanding why such a network of specialized IS development organizations is supposed to be able to produce higher-quality solutions, it is important to discuss what exactly constitutes a high quality IS. As it has already been hinted upon at various instances, the assessment of IS quality is difficult. Therefore, a brief delimitation of the scope of this discussion is appropriate. Obviously, the spending (of a client organization) on IS is in no way different from spending in any other field, the goal of it being an increased performance of this client organization. Thus, one could argue that a high quality IS is one that has an immediate (preferably positive) effect on the adopting organization's productivity. However, as it has been discussed in Section 2.1.2.4, research on the IT productivity paradox has doubted the direct relation between spending in IT (in general, not limited to IS!) and firm productivity (Brynjolfsson, 1993). The recent attempt to open this *black box* between IT spending and firm performance is also well-known in IS literature. In this context, DeLone and McLean (1992, p. 61) state that "the information system creates information which is communicated to the recipient who is then influenced (or not!) by the information." Since this work focuses on the development of IS, the later stages of the use and the ultimate impact of these systems cannot be considered anymore. The focus of IS quality is depicted through the shaded area in Figure 2.12[57].

In this context DeLone and McLean (1992) understand *service quality* as the quality of the services that the IS department is delivering to the end-users. As this factor is only very indirectly related with a standardized enterprise IS that is developed by an external party, this dimension is not further considered here. In contrast, *system quality* encompasses such factors as reliability or efficiency of the system, but also accuracy or currency of the data used in the system. Information quality in contrast refers for example to the importance, relevance, or usefulness of the provided information. Referring to the distinction between the software of an IS and the knowledge embedded in that software (see Section 2.1.1.1), it can be argued that the first dimension largely covers the

[57] See DeLone and McLean (1992, p. 87) for the original *IS Success Model*.

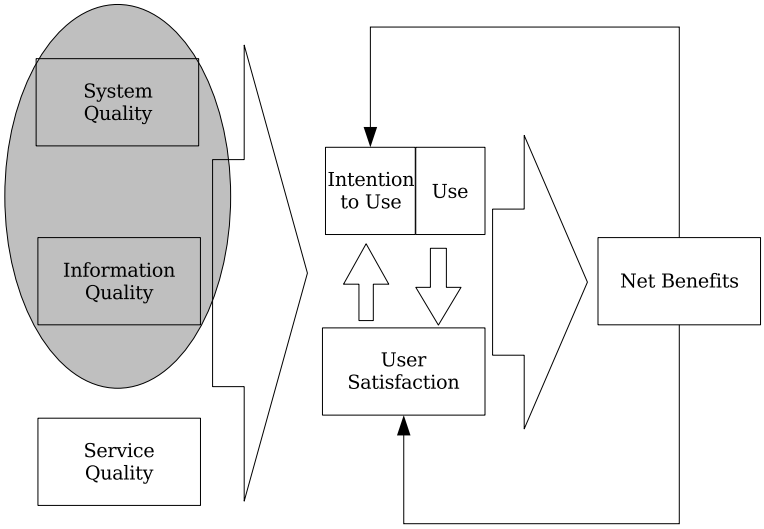

Figure 2.12: The Updated IS Success Model.
Source: Based on DeLone and McLean (2003, p. 24).

quality of the software while the second covers the quality of the embedded knowledge[58]. The difference between these two concepts is one that Pfeffer and Salancik (1978, p. 11) labels as *efficiency* vs. *effectiveness*. The first refers to an internal assessment measuring how well something is done; the latter is an external assessment measuring how well demands are met. These two aspects are also recognized as fundamental building blocks of software quality. Gillies (1992, p. 7) states that the two core questions that determine whether a software is of high quality are: "Is it a good solution?" and "Does it address the right problem?" The impact that a modular IS development industry that is consisting of various highly specialized companies can have on those two aspects is discussed subsequently.

Especially when considering errors in software, it becomes obvious that the quality of the software is crucially dependent on the expertise of the developer responsible for it. O'Brien and Marakas (2006, p. 414) report that "independent audits have found errors in as many as 30 percent of the spreadsheet models" that have been developed by users. While often these errors have minor effects, O'Brien and Marakas (2006, p. 414) also discuss the example of a multi-million dollar loss due to one of these errors. Furthermore, it has to be noted that errors are not confined to user-developed solutions. Experienced programmers produce code which contains errors in three to seven percent of all lines of this code. Even with professional debugging procedures this ratio can

[58] The above made assessment that these two factors are in the (sole) responsibility of the IS developer(s) is not entirely true. Especially the information quality of a running system is to a large extent dependent on the users of the system. See for example the concept of *information orientation* as discussed in Marchand et al. (2000, 2001).

be reduced to no less than one or two errors per thousand lines of code (O'Brien and Marakas, 2006, p. 414). What is even more important is that the errors made by professional programmers are often not the prevalent technical errors made by users when developing spreadsheets. Rather, *logical* errors are made, because programmers are lacking the non-technical business know-how necessary to implement highly specific solutions[59]. In contrast to technical errors, these logical errors are often much harder to detect. Since they also do not result from technical inability, as most of the errors made by users, but rather from missing know-how of the specific problem, consequences from these kinds of errors are potentially much more severe.

However, the above conducted discussion of differences in errors per line of code written by a regular user, an experienced programmer, and those controlled through sophisticated debugging procedures already indicates that errors in the code do not have to be accepted without possible countermeasures. First, sophisticated quality management principles can be applied in the software development process[60] (Wieczorek and Meyerhoff, 2001). However, albeit these quality management tools can result in reduced error proneness of developed software, the measures are far from perfect. Especially when it come to the above discussed errors in the *logic* of a piece of software even highly sophisticated instruments cannot easily detect them. The reason for this can again be seen in the fact that IS are an *intellectual* rather than an *industrial* technology (see Section 2.1.1.3). Since intellectual technologies are exactly not constraint by physical aspects, but only by the imagination of their users, they can be used "in virtually unlimited ways to solve problems or organize information" (Curley and Pyburn, 1982, p. 33). However, due to the fact that there are unlimited ways to use an intellectual technology in combination with the missing physical specificities that would allow for an objective measurement of results, an assessment of the quality of the system is very difficult. For an industrial technology, say a machine that produces a certain workpiece, assessing its quality is rather easy. It can be measured how fast, how accurate, or how reliable a workpiece is produced. For logical errors in an intellectual technology this easy assessment is not possible. This fact is even intensified as these intellectual technologies are subject to frequent change (see Section 2.1.1.3).

Therefore, software development often relies on a concept taken from another discipline that is producing intellectual outputs - academic research. Since research is similar to software development in that it is very complex and involves highly specialized knowl-

[59] This again refers to the differentiation between *efficiency* and *effectiveness* (Pfeffer and Salancik, 1978, p. 11). So the technically ingenuous user of a spreadsheet software is knowing very well *what* he is trying to achieve. However, he does not know *how* to achieve it correctly. Contrary to this, the professional programmers knows very well *how* to implement a certain functionality. However, he does not know *what* exactly the functionality is. In this context the fact that developers are users and users are developers is often cited as on of the advantages of *open source* software.

[60] A good example for one of those principles is also the concept of *six sigma* that has been developed in the automobile industry and is currently transferred into IS development (Biehl, 2004; Tayntor, 2002).

edge, the best way to assess the quality of it, is through the opinions of other experts in the specific field. Thus, before accepting a scientific paper for publication or sponsoring a scientific project, the opinion of other researchers is obtained by the publishing or funding entity. Only if these assessments certify the quality of the proposal, it is accepted for publication or funding. This concept is commonly labeled as *peer review*. Similar to the academic concept, peer review in the software development requires one expert programmer to check the code written by another. Thus, a logical error made by the first programmer can be detected through the critical assessment of the second. Especially when it comes to logical errors, this still is the best method for error detection in the software development process[61] (Paulk, 2001; Williams et al., 2000). The fact that error fixing is becoming more expensive the further a project has proceeded[62] is also the reason why many modern programming methodologies rely on active peer review during the early phases of the development process. Thus, one of the pillars of *extreme programming* is *pair programming*, the fact that code is developed not by a single programmer but at least two of them (Beck and Andres, 2004; Williams et al., 2000).

As this discussion on the assessment of the quality of software has shown, the best way to develop a high quality IS (component) is through the involvement of multiple, highly focused experts early on. However, in order to achieve this goal the involved experts have to be both able and willing to contribute to the project (Feller and Fitzgerald, 2000). This is especially true for the development of highly specialized solutions. It is now the crucial argument of this section, that both aspects are more pronounced in the highly specialized complementing organizations of an IS development network than in the large central vendor. This has two reasons. First, the fact that these complementers focus - and focused in the past - on highly specific niche markets makes it easier for them to stay abreast of the developments in this field. Going back to the concepts of time compression diseconomies, interconnectedness of assets stocks, and causal ambiguity from the resource-based view it has to be argued that the skills necessary to compete in these well defined fields cannot be easily obtained from neither other spokes, not the hub. Thus, for such a specific field, *knowledge-accessing* networks in the sense of Grant and Baden-Fuller (2004) are the best way to utilize these resources. Furthermore, the smaller size of these partner organizations is also expected to be lead to more intense exchange relations between employees of the complementers. This results in an increased willingness to dwell on details of each others' code in order to eliminate errors[63]. Therefore,

[61] This is also reflected in the discussion on the quality of *open source* software. Proponents of open source software argue that it tends to be of higher quality (at least for the large projects) because so many people can access the source code and thus find errors. Raymond (1999) comments on this with his famous quote: "Given enough eyeballs, all bugs are shallow." Glass (2003) however, counters this argument with the observation that more than two to four *peers* reviewing the code do not result in better quality.

[62] Davis (1995) reports that fixing an error that is detected in the finished software is forty times more expensive than one that is detected during the conceptual design phase of a software project.

[63] North (1991) for example notes that opportunistic behavior prevails only if there is a large number of individuals involved.

one of the hub's objectives for adopting a strategy of cooperative growth through inter-organizational networks is the accessing of these superior components that are developed by spokes. With consideration of the alignment of the resources it is furthermore argued that these components can be either supplementing (e.g. offering a similar, yet superior functionality) or complementing (offering a different functionality). This is reflected in the first proposition on technological benefits:

> *Proposition* T_H. Large IS producers (hubs) are partnering with smaller software producers (spokes) in order to gain access to narrowly specialized software components that either supplement or complement their own solutions.

However, as it has been argued above, the participants in the IS Development network are independent organizations that voluntarily join the network. Thus, while the above given proposition argues why the large hubs join or even foster such a network, it does not offer any insights on the question why the smaller spokes do so. A first attempt to answer this question has to take into account the current situation of the IS development industry. As it has been noted in the introduction to this work, two highly interrelated trends have been dominating this industry during the last decades: The first trend has been the emergence of the ERP systems that include more and more functionality. As a logical consequence of these newly developed systems, an immense tendency towards highly consolidated structures has been observable in the industry (Campbell-Kelly, 2003). This last trend has been so strong, that currently IS development is in the hand of only a few global players (Farhoomand, 2006).

This availability of an integrated IS has to be considered the key technological resource of the hub organizations. Similar to the ability to develop high quality, niche solutions of the spokes, this ability has been built through several of the mechanisms that have been described in the theoretical discussion above. Thus, copying it would involve foremost the availability of such an integrated system, which has been developed by the current incumbents over decades. From a resource-based view, developing such a system is far from easy. It requires time and a certain aggregation of assets, foremost knowledge. Furthermore, since the system is an internally highly intertwined software, these assets have to build upon each other. Finally, it is questionable whether all these assets together enable an aspiring system architect[64] to really construct such a platform, or whether the emergence of the current players has happened due to, for example, specific historic circumstances. Taken together, all these aspects neatly describe what Dierickx and Cool (1989) and Barney (1991) offer as antecedents for sustained competitive advantage[65]. Thus, the fact that the hubs already have developed such an integrated system that

[64] Gawer and Cusumano (2002) strikingly call them platform *wannabes*.

[65] This should not be taken as an argument that currently dominating players in the IS development industry will dominate forever. This has already been discussed on the basis of the following quote taken from Barney (1991, p. 103): "That a competitive advantage is sustained does not imply that it will "last forever." It only suggests that it will not be competed away through the duplication efforts of other firms. Unanticipated changes in the economic structure of an industry may make

readily available includes most of the basic functionality that a customer needs promises to be the key driver for participation in the network by spokes. Thus, the second proposition in the area of technological benefits is the following:

> *Proposition* T_S. Small software producers (spokes) are partnering with large IS producers (hubs) in order to gain access to their broadly established technology base.

The here discussed benefit category that drive the organizations in the IS development industry towards adopting a networked structure has emerged inherently from the fact that the hubs and the spokes of this network have access to different types of technologies, either those already existent, or those currently under development. However, considerable benefits emerge from a third aspect in this relationship. The following section addresses the access to specific customer markets as the final broad category of benefits.

2.2.3.3 Market Benefits

The final, and again closely related, aspect that is promising to be a prime reason for both hubs and spokes to participate in such an inter-organizational network is the ability to address novel markets. The existing enterprise IS have been developed out of the striving for a "seamless integration of all the information flowing through a company" (Davenport, 1998, p. 121) and their deployment is therefore a large, highly complex, and long-term project (Bingi et al., 1999). This indicates that two assumptions have to be made about the organizations that use these systems: They have to show considerable intensity and complexity in their information flows, and they need the resources (financial and other) to tackle such a large project (Bingi et al., 1999). Both aspects are present mainly in large, often globally acting corporations, which have therefore been the traditional market for large IS vendors (Piturro, 1999). However, recently the market became more and more saturated - most large corporations either already possess various enterprise IS, or deliberately decided against implementing one (von Everdingen et al., 2000; Farhoomand, 2006). Therefore, the vendors of these systems have to address new markets in order to sustain the growth rates they achieved in the past.

what was, at one time, a source of sustained competitive advantage, no longer valuable for a firm, and thus not a source of any competitive advantage." In the computer industry in general, such changes have been repeatedly observed, the most prominent being the shift from mainframe computers to personal computers that dispossessed IBM of its dominating market position (Baldwin and Clark, 2000). However, in the context of this work it can be argued that the emergence of SOA is not such a *radical* innovation Henderson and Clark (1990), mainly because most of the used Web Services are not created from scratch, but rather carved out from existing applications (Holland, 2002), which are those of the dominating players.

The platform architecture that is currently emerging promises to be ideal for this addressing of new markets. As has already been discussed, first at a general level as part of the hub-and-spoke architecture, and then again in the preceding section on technological benefits, in this architecture the general functionality is embedded in the platform, while specialized functionalities are provided by complementers (Morris and Ferguson, 1993). Since, as it has been argued above, the smaller complementers can be more efficient in developing their well-defined solution, they do not necessarily need the number of sales that the large vendor would require to recover the costs of developing such a solution (this is already discussed above as a result of the ability to more effectively produce components). Consequently, complementers can address narrower markets than the large vendor would be able to[66]. Organizations that have special needs, and have therefore up to not been in the focus of (standardized) IS developers, can now utilize the combination of general functionalities of the platform and specialized functionalities provided by individual solutions. This type of development is right at the heart of the dialectical blurring of the line between thesis and antithesis of individually tailored and standardized systems (Sommerville, 2004, p. 6) that has been one of the key motivators for this work (see Sections 2.1.1.1 and 2.1.3.1). The platform takes advantage of the mass-marketability of a standardized system, while the specialized components take advantage of the individualized solution quality of bespoke systems (Sprott, 2000). Together, both are a highly attractive solution for customers that have so far not been addressed by (standardized) IS. Considering the fact that large IS vendors are selling their systems to diverse customers worldwide, there are still ample opportunities to improve the systems' adequacy for specific customer requirements. Soh et al. (2000) give three types of potential *misfits* that very well illustrate this room for improvement: Country-specific and company- or industry-specific misfits. These are addressed subsequently.

Under the label of country-specific misfits especially cultural aspects are of prime importance Soh et al. (2000). Liang et al. (2004) for example argue that, although the world wide ERP market is dominated by a hand full of global players, these do not hold a significant market share in China. The reason for this lies mainly in the fact that standardized IS do not meet the country specific requirements of this region. Consequently,

[66] Obviously, market access is important for all players in the IS development industry. While needing customers is a necessity for all firms in all industries, this is especially true for those in IS development, as IS are inherently information goods, which are subject to the first-copy effect (see Section 2.1.1.3). Thus, developing a component of an IS - which consists of the software and the know-how embedded in it (see Section 2.1.1.1) - involves high start-up costs. Once the embedded knowledge is available and/or the software is written, reusing it is much cheaper - almost zero for the written code, but also significantly lower for the available knowledge (Cusumano, 2004). Therefore, companies in the IS business need a considerable number of sales for their component to break even. Messerschmitt and Szypersik (2000, p. 50) argue, that "a rule of thumb is that a reusable piece of software needs to be used at least three times to break even." However, as it has been argued above, smaller, more focused IS developers are able to be more efficient in developing their solutions. Thus, these highly focused and efficient niche players also need a lower number of sales. It has to be mentioned that this is still definitely more than one sale, which would make the system an individually tailored one.

the Chinese market is largely in the hand of Chinese companies. In order to overcome this handicap, Liang et al. (2004, p. 71) "emphasize the need for localizing strategies, even for the global ERP leaders." Wang et al. (2006) also elaborate on the Asian context and conclude that besides culture, also other nation-specific aspects such as legal or procedural differences are important. This is also addressed by Martinsons (2004) who argues that, especially in China, the differences between state-owned enterprises and private ventures have an enormous impact on the requirements of enterprise IS. So, while the Chinese market is probably attractive enough to eventually convince global IS developers that local adaptations are a worthwhile endeavor, there are also various smaller regional markets, especially where the administration is federally organized, in which such a regional adaptation is not promising enough for the large hub organization.

The other aspect that large IS vendors hope to address through the adoption of modularized development is that of company- and industry-specific misfits. One of the prime examples for this type of misfits are the specific needs of small and medium-sized enterprises[67] (SMEs). The traditionally all-or-nothing approach of IS deployment has discouraged many smaller enterprise to implement one of these systems. Often these enterprises are in a special situation termed *resource poverty* by Welsh and White (1981). That is, they possess just enough resources to run the day-to-day operations and any unsuccessful deployment of a significant share of these resources would lead to catastrophic results. Considering the already discussed efforts in time and money required for an enterprise IS implementation project, many smaller organizations simply shy from devoting substantial resources to a project which allows them to gain access to a set of functionalities which they, at least to a large extent, cannot even fully utilize due to general under-computerization of SMEs (Iacovou et al., 1995). Rather than deploying a quality system, they choose to implement low-cost systems, which often also do not meet their requirements and therefore tend to make matters even worse (Thong, 2001). Thus, large enterprise IS vendors have only recently been able to break into this new market to some extent (von Everdingen et al., 2000). The main reason for this can be seen in the adoption of a modularized IS development approach, which allows for the addition of third-party components specifically tailored to SMEs (Kumar and van Hillegersberg, 2000). Especially important for this discussion is the finding of recent studies that the SME market is far from homogeneous. Rather, medium-size companies are more similar to larger ones than to very small ones - at least when it comes to adopting large enterprise IS (Laukkanen et al., 2005). So, for very small organizations large enterprise IS like ERP are - even if they are modularized - still oversized. However, especially medium-size enterprises now have to opportunity to pick those parts of the system that they really need - and leave the rest.

[67] The market of SMEs is address exemplarily, because it is a potentially very big market and thus is currently in the focus of research on this topic. Other ones, like government agencies (Fuggetta, 2003), exist and have already been mentioned. However, due to the small number of potential customers in these segments there is much less coverage in the literature.

Obviously both aspects closely interact with each other. It can be assumed that most customers do not deploy the platform in its entirety, but rather choose those components that best match their needs. Wherever these components are not available from the platform vendor, customers can either purchase them from independent third parties, or they can develop them themselves. This flexibility for customers is assumed to be a key factor in cultivating new markets that have not been addressed so far - either due to their special needs, or because the organization did not possess enough resources to handle a project of such size.

Furthermore, it has to be noted that especially in the context of IS markets, the relationship between supplier and customer is of prime importance[68]. Somers and Nelson (2004, p. 260) for example argue that, "as a better fit between the software vendor and user-organization is positively associated with packaged software implementation success (...), vendor-customer partnerships are important to successful ERP projects." Butler (1999) goes even one step further and argues that users of these systems should form a strategic relationship with their developers in order to benefit from seamless future interaction. The reason for this can again be seen in the fact that IS are experience goods (see Section 2.1.1.3). As the customer to a considerable extent depends on the recommendations of the developer, a good relationship between them is imperative for success. As these relationships require considerable time to emerge (Kumar et al., 1998), as they are causal ambiguous and socially complex in that they depend on the people involved in the relationship, these also classify for being a key resource of spokes that the hub attempts to access. Therefore, the following proposition summarizes this market objective from the hubs' perspective:

> *Proposition M_H.* Large IS producers (hubs) are partnering with smaller software producers (spokes) in order to extend their market reach through accessing their narrowly specialized markets.

While the similarity between technological and market benefits has been undeniable for the hubs' perspective, this similarity is even more distinct for the spokes' perspective. As it has been argued throughout this study, the integration of different systems (components) is a key requirement for modern IS (Mertens, 2005). Especially the seamless integration of the entire information flows within an organization has been the differentiating factor that made ERP systems such a success story during the last two decades (Davenport, 1998). Thus, it can be argued that the solutions provided by the spokes in the IS development network have to be seamlessly integrated into the system landscape of a client organization, which is currently dominated by the large ERP systems. As it has been argued above, the smaller spokes do exactly not possess the resources

[68] This should not be mistaken for Customer Relationship Management (CRM) systems, which help organizations to improve the relationship they have with their customers. Rather, the emphasis here is the relationship between the organization that is developing the system and the organization that is using it.

necessary to develop such a large and complex system. Thus, in the oligopolistic industry of IS development, which is characterized by few large players dominating the market (Farhoomand, 2006), the market entry of spokes crucially depends on the interoperability of their solution with the existing large systems developed by the hubs.

This dependence on market entry has also another aspect, that of maintaining an existing system. Since most of these systems are intended to be used for years if not decades (Warren, 1999, p. 1), maintenance of the system is a crucial part of the software lifecycle: "A number of surveys over the past 15 years have also shown that for most software, software maintenance occupies anything between 40% and 90% of total life cycle cost" (Bennet, 1996, p. 674). Software maintenance is very important due to the continuous innovation that IS are subject to (see Section 2.1.2.2). Especially since much "vital business knowledge (...) is embedded in many old systems" (Warren, 1999, p. ix), so that their replacement would be even more costly than their maintenance. This also indicates that maintaining such a system is an ongoing process. However, this also denotes that this ongoing process would stop if the organization that has been developing the system ceases to exist. As such a developing organization is dissolved when a company becomes insolvent, and most of the knowledge embedded in this organization is therefore lost, many customers avoid buying systems (components) from small companies, since it is assumed that these are especially vulnerable. Thus, the fact that a hub organization, with their successful history and sheer size, partners with a smaller software vendor can be assumed to increase - in the eye of the customer - the reliability of this smaller software vendor. These aspects promise to be a key objective for the spokes to participate in such an IS development network:

> *Proposition M_S.* Small software producers (spokes) are partnering with large IS producers (hubs) in order to extend their market reach through accessing their broadly established markets.

This future orientation also hints upon the first proposed benefit for an inter-organizationally networked structure in the IS development industry. Both technology- and market-benefits are largely based on resources that the different participants in the network possess. However, as has been discussed under the heading of *dynamic* capabilities, it is especially important how these resources can be adapted over time. While efficiently and effectively developed systems guarantee a high degree of *as-is utility*, many system quality models also incorporate a future oriented dimension. Most of these models that measure system quality are *hierarchical*. That is, they possess a set of quality categories, which in turn consist of several subcategories, and so on[69]. Among the most well established hierarchical system quality models is that of Boehm et al. (1978), who argue for a quality assessment on the basis of the two high-level dimensions of how useful the system currently is, and how well it is able to accommodate to future changes. As has been mentioned, it is an idiosyncrasy of IS that they are undergoing a continuous

[69] This is true for most complex systems, see Section 2.1.2.1.

adaptation process. Thus, innovating the components that constitute such a system is an inherent necessity of IS. This ability of the networked IS development industry to constantly innovate the system has been addressed before.

2.2.4 Summary

The preceding theoretical discussion has evolved around the first research objective of why IS developing organizations are adopting a cooperative growth strategy. As the underlying theoretical perspective on this issue has been that of the resource-based view, it has been argued that especially those resources or capabilities of organizations are of prime importance that are difficult for others to imitate. The discussion has thus focused on benefits of the inter-organizational approach in the IS development industry and has yielded the insight that three broad categories of benefits promise to be relevant in this context. As the proposed structure for this industry is that of a hub-and-spoke network, these three categories of benefits have been discussed with regard to the two roles that can be found in this type of network.

First, innovativeness has been considered a key capability. Large IS producers partner because they can leverage the innovativeness of smaller partners in specific, well-defined areas. Small organizations partner, because they in turn can leverage the ability of the large hubs to innovate the entire architecture. Second, from a technological perspective it has been argued that large software developers partner with small ones, because these possess the ability to develop superior software components in narrowly defined areas of expertise. Contrary to this, the ability to access the existing technology base of the large organizations has been proposed to be key for the smaller partners. Finally, from a market perspective, hubs partner with spokes, because these possess superior skills in addressing specific niche markets. Again contrary to this, small spokes partner with hubs because these have a large installed base that represents a large potential market for the spokes. However, it has also been mentioned at various instances that - at least in the context of IS development - these categories are not mutually exclusive. Rather, each category seems to influence the other two in some way or another. To exactly define these inter-relationships is thus a further, implicit goal of this study. A comparison of these propositions is illustrated in Table 2.1.

While these benefits are motivating IS development organizations to participate in industry networks, the realization of these benefits is by no means an automatism. Rather, it is dependent on a deliberate management of the relations between participating organizations in the network. Therefore, after a brief summary of the benefits of inter-organizational networks in the IS development industry, the next part of this chapter therefore discusses difficulties that arise from the inter-organizational IS development process, their underlying assumptions, theoretical foundations, but also proposed remedies. Again, this discussion focuses on both hubs and spokes, which are conjointly responsible for the success of the overall network (Das and Teng, 2000; Eisenhardt and Schoonhoven, 1996; Lavie, 2006; Powell et al., 1996).

Capability / Resource Category	Hub Perspective	Spoke Perspective
Innovation	Accessing the capability to develop and deploy modular innovations.	Accessing the capability to develop and deploy architectural innovations.
Technology	Accessing narrowly specialized technologies, either complementary or supplementary.	Accessing a broadly established technology base.
Market	Expanding market reach through accessing narrowly specialized markets.	Expanding market reach through accessing broadly established markets.

Table 2.1: A Comparison of the Benefits of Hubs and Spokes.
Source: Own Assertion.

2.3 Explaining the Management of Inter-Organizational Networks

The last section has been discussing the (inter-organizational) division of labor, with special focus on what resources or capabilities should be located at which organization in order to make them first of all attractive for participating in such an inter-organizational network, but also preparing the network to be an attractive structure for the IS development industry. As the introductory discussion on fundamental functions of organizational structure (in Section 2.2) has shown, once such a inter-organizational division of labor is achieved (i.e. a network has emerged) all participants have to interact in conjointly managing the new structure in some way (Malone and Crowstone, 1994; Mintzberg, 1979b) in order to realize these potential benefits. As this management is obviously a costly endeavor, a closer analysis of these costs is necessary in order to ensure that they do not offset the above discussed benefits that can be realized through joining a network. Thus, this section focuses on the second research objective, to analyze how such a network can and should be managed. In order to answer this question, first an analysis what exactly causes this need for active management is conducted. As it has been convincingly argued, management of such a network is facing two distinct difficulties: those that emerge from the partners' behavior and those that emerge from the inherent complexities of the separation of task[70] (Gulati and Singh, 1998; Gulati, 1998).

[70] Obviously, these two types of issues are highly inter-connected. Nevertheless, the underlying foundations for each set of issues are different. For this reason, it has been decided to address these underlying foundations in separate sections.

The first of these two issues is mainly based on the interaction of two (or more) economically and legally independent entities. As behavioral uncertainty is supposed to be pervasive in such relationships between organizations, these merit careful management. In order to distill potential management practices for networks, the first part of this section introduces behavioral assumptions that are fundamental for all kinds of interactions between independent organizations. Based on these assumptions, then fundamental theories that have been used to better understand this type of relationship are introduced. This understanding of theoretical implications is proposed to be imperative for distilling the issues that organizations in this context face, and furthermore to develop counter measures that allow these organizations to successfully manage these relationships with the minimal effort possible.

Besides these difficulties that stem mainly from behavioral issues, there are also those challenges that arise from the inherent complexities of an inter-organizational network, which are not related to behavioral issues. As the participating partners conjointly develop one integrative system, the different parts of the system have to interact with each other[71]. Since these interdependencies between the different components result in inter-organizational interdependencies, their management constitutes a key challenge in the network. Again, this coordination between various interdependent entities has received considerable attention in the field of organizational science. Therefore this discussion highlights various approaches on how these interdependencies within the network can be managed.

Interestingly, the proposed management approaches for both types of issues seem to be closely mirroring each other. Thus, in a final step, potential ways and means on how to address these issues are developed from this theoretical elaboration. The final part of this section also relates these proposed management mechanisms explicitly to the IS development context. Here again groundwork has already been laid in the vast body of literature on the topic. Thus, these underpinnings of how to manage these behavioral and inter-dependence issues are discussed in due depth and, similar to the proceeding of the last section, again rough propositions are formulated that are used to guide the empirical part of this study.

2.3.1 Behavioral Issues in Inter-Organizational Networks

The discussion of this first broad category of management concerns is to a large extent focusing on behavioral issues in inter-firm relationships. It is based on the underlying assumptions of conflicting goals and the willingness to implement them against the partners' will in combination with the inability of partners to detect this kind of behavior. The combination of these two assumptions leads to serious difficulties in the relationship. Consequently, as a first step these underlying assumptions are briefly in-

[71] Please refer to the dialectical perspective of loose coupling in Section 2.1.2.1. From this perspective, subsystems of loosely coupled systems are characterized by the coexistence of *distinctiveness* and *responsiveness*.

troduced. There are several theories that are based on these assumptions, which are then discussed in due depth. The first of these theories, transaction cost economics, explicitly analyzes causes of costs that incur when transactions are carried out through different inter-organizational governance structures. These causes are also assumed to be of prime importance for the context of this study. Similar, agency theory addresses relations between a principal that delegates work and an agent that executes it. Stemming from the separation of ownership and control in modern organizations, this theory has been augmented to various, among them also inter-organizational contexts. Building on this, the perspective of property rights addresses these issues through emphasizing the perspective of a group (such as a firm on an individual level, but also a network on an organizational one) as a coalition of independent resource owners that temporarily cooperate. This view is complemented through the discussion of incomplete contracts that are used to explain long-term relations in such groups. Similar to the approach of the last section, these discussions so far do not relate to the specific IS development context. Rather, this section is intended to discuss the underlying theories in their *pure* form. The connections with the research context are then introduced in the last part of this chapter.

2.3.1.1 Underlying Assumptions of Behavioral Issues

Before discussing the proposed theories, a brief introduction to the history or background of these theories is appropriate. They all can be classified as belonging to the group of so-called *theories of the firm*. These theories[72] address questions like "why do firms exist?" or, in this context probably more important, "what factors determine the scope and size of the firm?" (Seth and Thomas, 1994, p. 166). The various theories from this field have developed in highly diverse directions. Yet, the underlying origin of theories addressing these questions is usually given as *neoclassic* economies.

The main focus of neoclassical economic concepts is on explaining market prices. Consequently, the level of analysis is an industry rather than the individual firms that constitute this industry. The firms are perceived as pure production function through which input factors - such as labor and capital - are transformed into output factors - such as different goods and services - through some underlying technology. Consequently, the firm itself is treated as a *black box* - its inner workings are of no concern for neoclassical theories of the firm. This also implies that firms are perceived to be speaking with one voice, there is no internal conflict on how a firm is supposed to act, a firm is thus equal

[72] The notion of *theories* of the firm already indicates that "there are a multitude of theories of the firm, and this naturally invites one to ask whether there is any way of distinguishing between the various theories" (Sawyer, 1979, p. 5). Especially the facts that theories often do not serve the same purpose, and that theories often relate to particular situations foredoom any attempt to conduct a exhaustive taxonomy of the theories of the firm. Why the here discussed theories have been selected is explained below.

to an individual. Furthermore, the neoclassical firm is assumed to interact in a perfectly transparent world (Richter and Bindseil, 1995). A firm is perceived to be an *economic man*, who

> is assumed to have knowledge of the relevant aspects of his environment which, if not absolutely complete, is at least impressively clear and voluminous. He is assumed also to have a well-organized and stable system of preferences, and a skill in computation that enables him to calculate, for the alternative courses of action that are available to him, which of these will permit him to reach the highest attainable point on his preference scale (Simon, 1955, p. 99).

The goal of profit maximization of firms is largely based on these two assumptions, which can be traced back to the intention of neoclassical theories of the firm to *predict* rather than *explain*. As Machlup (1967, p. 9) notes: "In this causal connection, the firm is only a theoretical link, a mental construct helping to explain how one gets from the cause to the effect. This is altogether different from explaining the behavior of a firm." However, this predictive nature has caused some severe criticism. Cyert and March (1992, p. 8) for example, summarize this criticism very bluntly when they state that "to some economists it has seemed implausible that a theory of an organization can ignore the fact that it is one." Thus, since explaining the inner working of firms can be considered a key motive for various scientific disciplines, opening this *black box* has received considerable attention. As a first step, a two-dimensional framework of underlying assumptions has been established that explains differences between actual behavior and that proposed for *economic man* (Williamson, 1985).

The first dimension is that of *rationality*. As has been argued above, neoclassical theories assume that firms are objectively rational[73] in following their clearly defined goals. However, in reality severe obstructions exist, that render this assumption inappropriate for a realistic treatment of any organizational behavior. Due to various reasons such as incompleteness of knowledge of the current situation, difficulties to anticipate future implications of actions, or the vast scope of behavior possibilities that are available at any point in time, Simon (1957, p. 67) argues that "it is obviously impossible for the individual to know all his alternatives or all their consequences." Rather than being objectively rational, organizations are therefore assumed to be *boundedly* rational. This concept can be summarized with "the observation that rational actors are significantly constrained by limitations of information and calculation. Because of those limitations, explicit and timely calculations of optimality are costly or impossible" (Cyert and March, 1992, p. 214). Or, to put it even shorter, firms' managers are "intendedly rational but only limited so" (Simon, 1965, p. XXIV).

[73] The definition of objective rationality used here is taken from Simon (1957, p. 76, emphasis in original): "A decision may be called "objectively" rational if *in fact* it is the correct behavior for maximizing given values in a given situation."

The second dimension is that of *self-interest orientation*. While neoclassical theories assume that organizations are aggressively pursuing their self-interests, they do this within the scope of what they are rightfully entitled to. Diamond (1971, p. 31) describes this behavior in neoclassical theories, when he states that actors are "playing a game with fixed rules which they obey. They do not buy more than they can pay for, they do not embezzle funds, they do not rob banks." Contrary to this, the subsequently discussed theories address the issue of *opportunistic* behavior. Following Williamson (1985, p. 47) opportunism adds the notion of *guile* to the concept of self-interest seeking. That is, "opportunism refers to the incomplete or distorted disclosure of information, especially to calculated efforts to mislead, distort, disguise, obfuscate, or otherwise confuse" others in order to gain an (unfair) advantage at the expense of others.

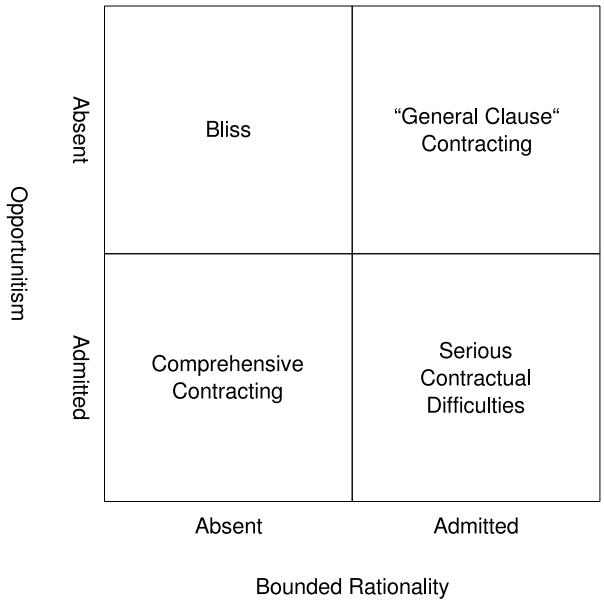

Figure 2.13: The Interplay of Opportunism and Bounded Rationality.
Source: Based on Williamson (1985, p. 67).

As Figure 2.13 shows, only the presence of both bounded rationality and opportunism results in severe behavioral difficulties when negotiating inter-organizational relationships. In case that both are absent, each party knows the situation of the other party perfectly well. Furthermore, both parties have no intentions to take unfair advantage of each other. Williamson (1985, p. 67) refers to this situation as "contractual utopia." In case that opportunism exists, but rationality is unbounded, it is possible to write a comprehensive contract that includes all current and future contingencies. This in effect makes any opportunistic behavior impossible. In case that rationality is bounded, but no opportunism exists, both parties could simply agree on a general clause that each party provides full information and engages to conjointly maximize profits, which are fairly

apportioned. As only this situation in which bounded rationality is paired with opportunistic behavior leads to problematic contracting, the subsequently discussed theories all address these issues. As these assumptions are still very broad, a further delimitation of the selected theories is based on the requirement of the theories to address issues on a firm-level through analyzing the mutual interactions that these firms are involved in. Following Knudsen (1995), essentially three theories are fulfilling these requirements.

First, transaction cost economics especially address issues like the size and the boundaries of firms (Williamson, 1975, 1985). The underlying assumption of this theory is that, just like there is a cost of a hierarchical organization, "there is a cost of using the price mechanism" (Coase, 1937, p. 390). Firms in this theory are perceived to be no more than an answer to the failure of the ideal of a perfectly transparent market (which is the underlying assumption of neoclassical approaches). Consequently, the size of the firm is determined through a trade-off between costs of market exchanges and costs of hierarchical organization: "A firm will tend to expand until the costs of organizing an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange on the open market" (Coase, 1937, p. 395). However, as Williamson (1985, p. 4) argues, "unless the factors responsible for transaction cost differences could be identified, the reason for organizing some transactions one way and other transactions another would necessarily remain obscure." Thus, Williamson (1985) identifies four potential (inter-)organizational structures and three factors that influence this structure. What exactly these are and how they relate to each other is discussed in the subsequent section on transaction cost theory.

Second, agency theory is historically based on the separation of ownership and control in modern enterprises. In the resulting relationship, the owner - called the *principal* - delegates some authority to the manager - called the *agent*. In this situation, it has to be assumed that the agent has divergent goals from those of the principal and that he might act opportunistic to pursue them. Due to bounded rationality of the principal, *uncertainty* exists in the relationship. Overcoming this uncertainty is resulting in costly frictions. Overcoming or at least reducing them is at the focus of this theory. While the theory originated in intra-organizational separation of ownership and control, the ideas from it have been generalized to the "ubiquitous agency relationship, in which one party (the principal) delegates work to another (the agent), who performs that work," and is therefore applicable in different settings, such as inter-organizational networks (Eisenhardt, 1989a, p. 58). How this reduction of frictions can be achieved is discussed in the section on this theory.

Closely related to the agency theory, yet illuminating different aspects (Jensen and Meckling, 1976, p. 308), another very important theory in this context is what Knudsen (1995, p. 193) refers to as "the nexus of contract view." Building on the work of Alchian and Demsetz (1972) it is argued that a firm cannot be seen as owning all its inputs. Rather, the constituents of a firm engage in a contractual relationship with each other only as long as it is beneficial for them. Alchian and Demsetz (1972) therefore consider each constituent as an independent resource owner, who contributes this specific

resource to the firm. The firm can be interpreted as a *team* of the members. The reason why a firm exists at all can therefore be found in the fact that this team approach is the most efficient solution to a problem of social cooperation (Knudsen, 1995; Seth and Thomas, 1994). Crucial to this approach is the fact that (due to bounded rationality), long-lasting contracts cannot be comprehensive. Rather they are *incomplete* in that they specify that an employer has some authority over an employee, and that the employee is accepting this authority. Again, while this theory originates in intra-organizational relations between different stakeholders of a firm, it is easily and fruitfully extended to the inter-organizational context described here (Oliver, 2001; Anand and Khanna, 2000). Exactly why this kind of contracting is beneficial for the entire relationship and how this long-lasting relationship can be realized is discussed in this last section.

2.3.1.2 Theoretical Perspectives on Behavioral Issues

Transaction Cost Theory. The first theory that is discussed as fundamental concept for this work is transaction cost economics. Transaction costs can be closer described through a comparison of economic and mechanical systems: "The economic counterpart of friction is transaction costs: do the parties to the exchange operate harmoniously, or are there frequent misunderstandings and conflicts that lead to delays, breakdowns, and other malfunctions?" (Williamson, 1981, p. 552). It is now the central argument of transaction cost economics that (inter-)organizational governance structures[74] are designed in order to minimize these transaction costs, just like mechanical systems are usually designed in order to minimize frictions. This entails two very important points: First, there have to be different, distinguishable organizational structures that can emerge as an answer to the first factors. Second, there have to be different, distinguishable characteristic factors within a transaction that determine the organizational structure. Each of these aspects is subsequently introduced.

Williamson (1985) lists four distinct organizational structures that can emerge as a result of different degrees of transaction costs, reaching from standardized, simple ones to highly specific structures. The most simple, standardized structure for a contractual relationship is a *market* structure. This structure is perceived to be ideal for short-term, spot markets in which the involved parties are not financially and otherwise dependent on a long term relationship (Williamson, 1996, p. 95). This tends to be the case for non-specific, commodity types of exchanged goods. As Ring and Van de Ven (1992, p. 485) note, "the conditions associated with these transactions are 'sharp in;' that is, they are accompanied by a clear-cut, complete, and monetized agreement. They are also 'sharp out,' i.e. the seller's debt of performance and the buyer's debt of payment are unambiguous."

[74] In the following the term *organizational structure* refers to *(inter-)organizational governance structure* in the sense of Williamson.

In case that this high degree of independence is not achievable or not desirable, Williamson (1985) argues for a *trilateral* organizational structure. In this structure, a dynamic change of the partners is not desirable. This structure is characterized through less flexibility and a lower degree of independence than the market structure. Once parties have entered into a contract, "there are strong incentives to see the contract through to completion" (Williamson, 1985, p. 74). However, in a longer lasting relationship opportunistic actors have to be prevented from taking unfair advantage of the other party. In the case of a trilateral structure, participants rely on "third party *assistance* (arbitration) in resolving disputes and evaluating performance" (Williamson, 1985, p. 75, emphasis in original). Another, even more specific, structure can be found if the dependence of the involved parties is even higher. As this dependence results in a self-regulating power of contract renewal (Williamson, 1975), opportunism is curbed through a situation of "mutual reliance" (Williamson, 1985, p. 190). Therefore, in this structure no third party is involved and the participants thus have an inherent motivation not to cheat each other. Thus, the structure is termed *bilateral* structure.

The final alternative described by Williamson (1985) is termed *unified* organizational structure. If specificities between the parties become so high, that assets are usefully applicable only for this very transaction there is no reason for an inter-firm separation of these assets. Since there are no economies of scale for single use assets, supplying them through internal or external sources promises to be of no difference. Thus, the superior ability to adapt a relationship if it is realized under unified ownership results in considerable "advantages of vertical integration" (Williamson, 1985, p. 78). Assuming that alignment of incentives for internal groups[75] can be realized, vertical integration commonly appears in situations characterized by such a high degree of idiosyncrasy.

Obviously, these organizational structures closely resemble those discussed in Section 2.1.2.3. Research on organizational networks has been influenced by transaction cost economics[76]. This raises the second important point of transaction cost theory, an analysis of which factors of a transaction can be analyzed in order to gain a deeper understanding of the organizational structure that is supposed to emerge for this transaction. Williamson (1985) discusses three factors that can be used to analyze a transaction. The first, which is also deemed to be the one that is "most important, and most distinguishes transaction cost economics from other treatments of economic organization" by Williamson (1985, p. 52), is asset specificity. This is defined as durable investments that "are specialized to a particular transaction" (Williamson, 1981, p. 555). With other words, investments are made idiosyncratically to a particular relation with a specific partner. In case that this partner changes, severe adverse (mostly financial) con-

[75] Following the perspective of a firm as a nexus of contracts, this not necessarily has to be the case. See below.

[76] However, there is considerable dispute on whether organizational structures can be classified in a continuum. Powell (1990) for example argues explicitly that *networks* do not fall in-between markets and hierarchies, but rather are a third option, distinct from both.

sequences have to be borne by the participating parties. Following Williamson (1985), there are four different types of investments that can lead to substantially specific assets in a certain relationship:

- Site Specificity.

  Investments in immobile assets that are made in order to capitalize on geographic proximity are often highly specific. If a supplier places his plant next to a client's site, realizing advantages from this setup is only possible with exactly this client. If the client changes, all advantages from this geographic setup are lost.

- Physical Asset Specificity.

  Even if assets are mobile they can be so specialized to a certain relation that they cannot be reused with other partners. An example for physical asset specificity might be a specific machine that serves a single purpose, or specific tools that are especially designed following a client's proprietary specifications.

- Human Asset Specificity

  Also investment in human resource development can be considerably specific. These investments can be either implicit, such as learning-by-doing, or explicit, such as training courses for specific tasks. It is however, important that developed skills are only applicable within a certain contractual relationship. So, for example training of general skills like typewriting does not increase human asset specificity (Williamson, 1985, p. 242).

- Dedicated Assets

  Contrary to the above discussed investments, dedicated assets result from the investments into general production capacity. However, there has to be an impetus for this investment through a specific customer. So, simply increasing productive capacity in order to gain a larger market share is not a dedicated asset. However, the same increase in productive capacity that is only realized due to a request from a specific customer can be considered a dedicated asset.

While there have been some additions to this list - Zaheer and Venkatraman (1994) for example add *procedural* specificity, and Malone et al. (1987) argues for a dimension of *time* specificity - these four factors have largely been found to suffice (Joskow, 1988). Taking together all the necessary investments for a contractual relationship, a degree of asset specificity can be compounded for this relationship. It is a crucial idea of transaction cost economics that this degree of asset specificity has a far-reaching impact on the organizational structure of the relationship. The higher the degree of asset specificity, the higher the involved adverse consequences if the relationship does not work out as expected. Therefore, more specific organizational structures, which also allow for more

control in the relationship, are appropriate in this context. Summarizing the discussion on how asset specificity influences organizational structure, can best be done with Williamson (1985, p. 78): "Market contracting gives way to bilateral contracting, which in turn is supplanted by unified contracting (internal organization) as asset specificity progressively deepens."

The second important aspect is the uncertainty involved in a relation. A deeper discussion of uncertainty is not conducted at this point for two, closely related reasons. First, this dimension is discussed subsequently as the crucial part of agency theory[77]. Second, Williamson (1985) does not further dwell on it besides stating that uncertainty is assumed to exist to a certain degree and that more uncertainty is assumed to lead to more specific structures[78].

The final dimension that influences the structure of a relationship is the frequency with which transactions occur. The reoccurrence of an unspecific transaction does not have any implications for the relationship between the involved parties. As (Williamson, 1996, p. 61) states it, "where no such specialized investments are incurred, the initial winning bidder realizes no advantage over nonwinners. Although it may continue to supply for a long period of time, this is only because, in effect, it is continuously meeting competitive bids from qualified rivals." However, if the specific investments are necessary, "the relationship between buyer and supplier is quickly thereafter *transformed* into one of bilateral monopoly" (Williamson, 1979, p. 241, emphasis in original). This in turn requires an enduring relationship between the involved parties, one that "might be provided if long-term contracts were negotiated, [and] such contracts are necessarily incomplete[79]" (Williamson, 1979, p. 241). Thus, the frequency of transactions in a

[77] The difference between the two theories is not clearly defined. Even Williamson (1996, p. 171) posed the question, "terminology aside, in what ways do agency theory and transaction-cost economics differ?" One of the differences that is mentioned by Williamson is the focus on individuals by agency theory and on transactions by transaction cost theory. However, as the subsequent discussion shows, this differentiation factor is becoming more and more blurred. This is also acknowledge by Williamson (1996, p. 172 ff), who states that, "real differences notwithstanding, these have been shrinking as each approach has come to work on issues previously dealt with by the other." The main differentiation that is used here, is based on the fact that transaction cost theory focuses to a large extent on asset specificity, whereas agency theory focuses on uncertainty, a point that is also recognized by (Williamson, 1996, p. 179).

[78] There is also some criticism to this point. Goshal and Moran (1996) for example argue that the idea of curbing uncertainty that results from opportunistic behavior of others through integration within a hierarchical governance might be counterproductive. Imposing more and more control over partners that are perceived to be opportunistic might cripple voluntary compliance, thus resulting in a self-fulfilling prophecy.

[79] As this quote shows, there is, similarly to the relation to agency theory, also no clear cut separation between the concepts of transaction cost theory and incomplete contracts. Here again, the focus of transaction cost theory on asset specificity and the focus of incomplete contracts on ensuring long-lasting relationships is used to differentiate between the concepts.

relationship, and therefore implicitly also its duration, is explicitly addressed in the discussion on incomplete contracts and the related concept of property rights that follows after that on agency theory.

Taken together these three dimensions influence the emerging governance structure of a contractual relationship. If asset specificity and uncertainty are high and the frequency with which transaction occurs is low, more specific governance structures can be, and should be, realized in order to minimize transaction costs. The relation between these different modes of governance and the above discussed dimensions of asset specificity and frequency of transactions are illustrated in Figure 2.14.

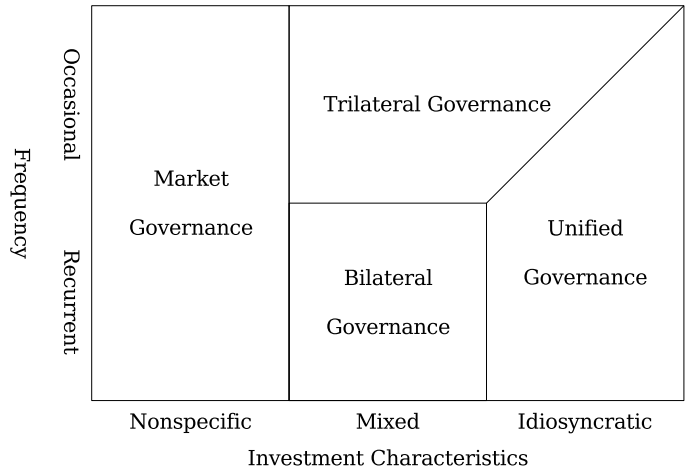

Figure 2.14: Efficient Governance Structures.
Source: Based on Williamson (1985, p. 79).

Agency Theory. The second theory - agency theory - is in its general form traced back to the fundamental work of Jensen and Meckling (1976). Their definition of the underlying idea of a principal-agent relationship is still valid today. They define "an agency relationship as a contract[80] under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent" (Jensen and Meckling, 1976, p. 308). This very well illustrates the origins of agency theory in the separation of ownership and control within a company - which is an issue entirely on an individual level (Berle and Means, 1932). However, later the concepts of agency theory have been

[80] Note that Jensen and Meckling (1976, p. 308) recognize the relation with *contractual* theories (see below) when they state that agency theory "literature has developed independently of the property rights literature even though the problems with which it is concerned are similar; the approaches are in fact highly complementary to each other." This supports the notion that different theories of the firm should be used in conjunction to gain a holistic perspective on a certain problem (Eisenhardt, 1989a). An approach also followed in this work.

generalized from individuals to *parties* and therefore, "the agency structure is applicable in a variety of settings, ranging from macrolevel issues (...) to microlevel dyad phenomena" (Eisenhardt, 1989a, p. 58). Even in this enlarged scope, the basic rationale behind principal-agent theory is aptly summarized by Jensen and Meckling[81]:

> If both parties to the relationship are utility maximizers there is good reason to believe that the agent will not always act in the best interests of the principal. (...) However, it is generally impossible for the principal or the agent at zero cost to ensure that the agent will make optimal decisions from the principals viewpoint. In most agency relationships the principal and the agent will incur positive monitoring and bonding costs (non-pecuniary as well as pecuniary), and in addition there will be some divergence between the agent's decisions and those decisions which would maximize the welfare of the principal (Jensen and Meckling, 1976, p. 308).

These combination of the three factors mentioned (monitoring and bonding costs, residual losses) are commonly defined as agency costs. The first category of monitoring costs refers to those costs that the principal has to pay in order to observe the agent's behavior. The second category of costs are those that the agent has to pay in order to show that he has no intention to behave opportunistic[82]. The last cost category, residual losses, refers to the fact that complete conflict resolution is not possible at a reasonable cost, and that therefore some loss is accepted even though monitoring and bonding efforts are made. However, the pure existence and classification of these agency costs is not enough to yield an understanding of the complex sources of uncertainty in such a relationship. Therefore, a deeper analysis of why these costs incur is necessary in order to develop appropriate countermeasures. Important for this discussion is the combination of uncertainty with opportunistic behavior from a point in time before the actual contract is closed, over the duration of the contract, to a point in time when the contractual relationship is already terminated.

Before actually signing a contract with an agent, a principal has ex ante uncertainty about the skills of the agent or the characteristics of the agent's product. This uncertainty is also referred to as *hidden knowledge* or *hidden information* (Laffont and Martimort, 2002). The fact that the agent is in this phase striving for successfully entering into a relationship with the principal, gives him an incentive to pretend to have superior skills or a superior product than it is actually the case. The moment the principal realizes the true skills or characteristics of the agent or his product, he has already

[81] This definition very well illustrates the underlying assumptions of opportunistic behavior (not acting in the best interest of the other party) and bounded rationality (impossible at zero cost to ensure the making of optimal decisions).

[82] Recently it has been convincingly argued that the two concept can be considered "the mirror image" of each other, differing only "in the assumption of which party moves first" (Sanders and Boivie, 2004, p. 169)

entered into the relationship. A direct consequence of this behavior is *adverse selection* (Eisenhardt, 1989a). Using, among others, the example of the market for used cars, Akerlof (1970) illustrates this problem very well. It can be realistically assumed that the seller of a used car (the agent) does have information about the quality of the car he is selling that the buyer (the principal) does not have. With this assumption in mind, low quality and high quality cars could be sold for the same price: Since the buyer cannot distinguish between high and low quality cars, the sellers of the latter can (unjustly) raise the price of their cars, while the sellers of the former have to (unjustly) lower their price. Therefore, owners of low quality cars have a higher incentive to sell their cars than owners of high quality cars. Under these conditions "it is quite possible to have the bad driving out the not-so-bad driving out the medium driving out the not-so-good driving out the good in such a sequence of events that no market exists at all" (Akerlof, 1970, p. 490).

During the duration of the relationship between principal and agent, the principal has ex interim uncertainty about the agent's behavior. Therefore, this uncertainty is also referred to as *hidden action* (Laffont and Martimort, 2002). The outcome of the actions performed by the agent on behalf of the principal is for sure correlated to the agent's efforts. But it can also be assumed that it is subject to some coincidence. Thus, the principal is uncertain about the causality between the agent's action and the outcome. Therefore, the agent has an incentive not to put too much effort into his work and later blame the environmental conditions for the failure. In the literature this is also referred to as *moral hazard*[83]. Eisenhardt (1989a, p. 61) mentions a scientist working on personal projects on company time as a perfect example of moral hazard: This scientist has the opportunity to pursue his personal goals at the expense of his employer, because "the research is so complex that corporate management cannot detect what the scientist is actually doing."

Finally, with ex post uncertainty, the agent knows more about the real results of his action than the principal does. This uncertainty is also called *nonverifiability* (Laffont and Martimort, 2002). Since his rewards can be expected to be linked to the outcomes of his actions, the agent has an incentive to be dishonest. In complex environments, the agent is hoping that the principal never correctly assesses the real results, or that warranties or other legal liabilities that might result from a faulty performance on the agent's side are already void. An example for this type of relation might be the one between a doctor and his patient. Since the patient does not have the medical knowledge

[83] An agent that is subject to a moral hazard is *shirking*. See below.

necessary to assess the proposed therapy, and since he cannot evaluate how his illness might have developed if he had consulted a different doctor, or none at all, there is no way to correctly assess the quality of the therapy[84].

Since the here discussed problems in a principal-agent relationship are all resulting from the co-existence of uncertainty with opportunistic behavior, there are two broad categories of remedies for the problems:

> One is to discover the agent's behavior by investing in information systems such as budgeting systems, reporting procedures, boards of directors, and additional layers of management. Such investments reveal the agent's behavior to the principal, and the situation reverts to the complete information case. (...) The other option is to contract on the outcomes of the agent's behavior. Such an outcome-based contract motivates behavior by co-alignment of the agent's preferences with those of the principal (Eisenhardt, 1989a, p. 61).

As agency theory has been assumed to mainly address the problem of uncertainty, the first of these two proposed remedies is considered to be most relevant. However, the issue of designing a contract in such a way that incentives between principal and agent are aligned is also considered to be of prime importance. Therefore, the following section discusses how relationships can be designed in order to ensure such an alignment of incentives, which makes long-lasting relationships possible.

Incomplete Contracts and Property Rights. Similar to the perception of agency theory, that an agent often does not behave in line with what would be best for his principal, Alchian and Demsetz (1972, p. 777) argue that a firm has "no power of fiat, no authority, no disciplinary action any different in the slightest degree from market contracting." Analyzing the firm as a specific form of team-work - in which different resources are used which cannot be clearly separated in the final product and which do not belong to the same party - it is argued that the main problem lies in monitoring each of the participants[85] (Alchian and Demsetz, 1972, p. 779). This is the fact because the participants[86] do not receive output according to their actual input, but rather according

[84] Another aspect of ex post uncertainty is introduced by governmental regulations. "As the rule-maker, can and does frequently *revoke* rights: It decrees that, henceforth, it will not be legal for individuals to use their property, or enter into contracts, in ways heretofore sanctioned" (Jensen and Meckling, 1978, p. 33). This change effectively results in ex post uncertainty when either dealing directly or indirectly (e.g. through the legal framework used in contracts) with the government.

[85] This closely mirrors ideas from agency theory. In fact sometimes contractual theories are subsumed as part of agency theory (e.g. in Seth and Thomas, 1994). However, the different foci of the two theories, as they are defined for this work, warrant the separation conducted by others (e.g. Knudsen, 1995).

[86] Also note that the nexus of contracts view as postulated by Alchian and Demsetz (1972) assumes that *participants*, *parties*, or *constituents* of a firm are individual employees. However, similar to the developments in agency theory, there are no objections to extending the scope of this theory to an inter-organizational level. In fact this is commonly done in more recent literature on the topic, such as Hart (1988), Oliver (2001), or Anand and Khanna (2000).

to the group performance. They therefore have an incentive to not contribute as much as they could - a problem commonly referred to as *shirking* or *free-riding*. In this context, it is argued by Alchian and Demsetz (1972, p. 783), that the *classical capitalist firm* is the most effective way to organize this type of value creating activities. This classical capitalist firm is defined through six characteristic points:

- Joint input production through
- several input owners with
- one party who is common to all the contracts of the joint inputs,
- who has rights to renegotiate any input's contract independently of contracts with other input owners,
- who hold the residual claim[87], and
- who has the right to sell his central contractual residual status.

The relationship between this central entity and the other members of the firm is one designed purely due to efficiency reasons in team production. There is no authority or fiat in this relation; rather it is characterized by continuous bilateral renegotiation between the involved parties. This arrangement is deemed efficient, simply because one party specializes on monitoring the others. The problem of monitoring the monitor is resolved through the fact that this monitoring entity has the residual claims of the entire organization and thus an incentive to maximize overall output. All the other parties are independent resource owners[88], which are bound to the monitor through contractual relations.

This perspective on why a firm exists, results in its perception as a nexus of short term, spot market like relationship. However, as it has been discussed throughout this work, this short term, spot market like relationship is not appropriate for all kinds of exchange. This essentially has two main reasons. The first is the fact that the short term nature of the contracts precludes firms to take advantage of longer lasting relationships with employees, which is often desirable. Both Demsetz (1988) and Alchian (1998) later on revoked this short term view and acknowledged the longer perspective. As Demsetz notes,

[87] *Residual claims* are defined as "the difference between stochastic inflows of resources and promised payments to agents" by Fama and Jensen (1983, p. 328).

[88] Considering a firm as a bundle of resources can also be considered a parallel to to the strategic management theories discussed above. The different foci of these theories also clearly support the structure chosen for this work. The focus of strategic theories is on what types of resources a firm should posses in order to be attractive for a network. Contrary to this, the focus of the here discussed theories is more on the management of the relationship. Thus, both theories are discussed separately from each other to gain a holistic picture of the IS development industry.

> continuing association of the same persons makes it easier for firm-specific and person-specific information to be accumulated (...). Knowledge about the objectives and organization of the firm is learned "cheaply" through continuing association, and so is knowledge about the capabilities and limitations of the persons involved in this association (Demsetz, 1988, p. 160).

However, arranging for a relationship that has a very long timeframe - not uncommonly measured in decades - is extremely difficult, due to the bounded rationality of the involved parties that has been introduced as one of the underlying assumptions of the here discussed theories[89]. As Holmstrom and Tirole (1989, p. 71) argue, "it is not possible to sign a contract today that will be effective in all contingencies tomorrow." This perception leads to the idea of *incomplete* contracts in which not all future contingencies have to be specified, but which allow for some flexibility and adaptability in the relationship.

In order to achieve this flexibility in the relationship the contract that is entered into "contains gaps or missing provisions" (Hart, 1988, p. 123), which allow the parties to interpret the contract as environmental conditions change[90]. This can be interpreted as giving the parties involved in the relationship some authority over each other[91]. Again on an individual level, this has also been recognized by Simon (1957, p. 116), who argues - well in line with the theory of incomplete contracts - that "the employment contract results in the creation of a continuing authority relationship between the organization and the employee." He restricts this continuing authority when postulating that "there is a limit, however, to this proposition. There is an area of acceptance within which the individual will behave "organizationally." When the organizational demands fall outside this area, personal motives reassert themselves, and the organization, to that extent, ceases to exist" (p. 204).

The term *area of acceptance*[92] is central to the theory of incomplete contracts and very contrary to the original ideas of Alchian and Demsetz (1972). Through embedding this concept into contracts, it is possible to realize long lasting and very dynamic relationships between different stakeholders. The idea of incomplete contracts is also going beyond

[89] As Hart (1988, p. 121) notes: "In a world where it was costless to think about, plan for, and write down provisions for future events, parties engaged in a trade would write a "comprehensive" contract which specifies precisely what each of their obligations is in every conceivable state of the world. Under these conditions, there would never be any reason for the parties to modify or update their contract since everything would be anticipated and planned for in advance. Nor would any disputes ever occur since an outsider (for instance, a court) could (costlessly) determine whether one of the parties has been in breach of contract and impose an appropriate penalty."

[90] There are considerable difficulties in defining an incomplete contract. As Tirole (1999, p. 743) note: "For all its importance, there is unfortunately no clear definition of "incomplete contracting" in the literature. While one recognizes one when one sees it, incomplete contracts are not members of a well-circumscribed family."

[91] Usually this authority is restricted to the central agent. However, the other way is also conceivable - especially if highly specific knowledge resides with the other parties.

[92] Simon (1957) adopted the term from Barnard (1938, p. 169), who called it "zone of indifference."

the above discussed ideas from agency theory to reduce uncertainty through increased monitoring or bonding. If a contract is considered as incomplete, it has to align incentives of the involved parties in order to successfully realize a long-term relationship. As (Hart, 1988, p. 123) framed it, "if the contract the parties write is incomplete, there must be some mechanism by which the gaps are filled in as time passes." Hart (1988) discusses *residual rights of control*, for which in his argument ownership (i.e. property rights) of assets is a prerequisite. In his discussion on the effects of property rights on investment decisions in a collaborative business endeavor, he argues that for efficiency reasons, it is not sufficient "to assign the various parts of the return scheme to the different managers (...), but also to allocate ownership and control rights to support this assignment" (p. 133). This is in line with the perception of Tirole (1999), who sees property rights as a necessity for successful investments in organizational development efforts.

2.3.1.3 Implications for Network Management

The present discussion on behavioral issues has built a foundation for understanding the second research objective of how relationships within such an inter-organizational network are supposed to be managed. In this context, it has been argued that essentially the co-existence of the two underlying assumptions of opportunistic behavior and bounded rationality is responsible for behavioral issues in the relationships. These two assumptions have been addressed in various theories that can be utilized to better understand the relationships between interacting organizations.

First, the discussion on transaction cost economics has hinted upon the fact that those transactions which require investments that are specifically to a certain relationship are rather unsuited for market- (or even network-) transactions. Thus, it can be argued that designing transactions in a way that requires these kinds of investments should be avoided. Rather, standardized exchange relationships promise to be a potential mechanism to reduce transaction costs and thus to shift the organizational structure from an integrated approach of the past towards that of an inter-organizational network. This approach somewhat deviates from traditional transaction cost theory, which is largely *normative*[93] and unidirectional in a sense that they prescribe managers how to react to the transaction cost situation in a certain given environment: "Firms that follow its [transaction cost theory's] prescriptions and align organizational form with transaction dimensions will economize on transaction costs, which in turn should translate into performing better than those who do not" (Geyskens et al., 2006, p. 523). Both the normative and the unidirectional nature of transaction cost theory's findings

[93] Theories can be defined as being either normative or positive. The first distinction between the two is usually assigned to the philosopher David Hume, who argued that statements could either address what *is*. These positive statements do not contain any indication of approval or disapproval and can be falsified. Contrary to this, statements can be normative, when they address what *ought to be*. These statements always contain a certain underlying value. Also, these statements cannot be ultimately disproven.

have been criticized in the literature. It has already been mentioned that Goshal and Moran (1996) attack the normative nature of this theory. In their view, following its prescriptions could lead to ever increasing opportunism as a result of more integrated organizational structures that were ultimately introduced to reduce this opportunism. However, as Goshal and Moran (1996, p. 15) also note, "all positive theories of social science are also normative theories, whether intended or not." Therefore, the main point of critique of transaction cost economics for this study is not the normative nature of the concept, but rather its unidirectionality.

Common knowledge assumes that organizations are supposed to design their organizational structure following the transaction costs that result from different types of transactions they are involved in. However, especially this viewpoint is attacked in a concept termed *relational view*. Dyer (1996) argues that firms are not imprisoned in the structure that best fits their current transactions. Rather, an organizational structure can be deliberately chosen, as long as transactions are designed accordingly. The obvious levers that an organization can use for adjusting transaction costs are those rooted in the traditional concept, here especially addressing asset specificity. So when attempting to shift an organizational structure more into a market direction, feasible measures would be those that lead to a reduction of asset specificity. When attempting to shift the transactional governance into the opposite direction of a more integrative approach, obviously opposed measures should be taken. In this context, especially standardization is a prime mechanism to reduce asset specificity: "Standards may facilitate market transactions by making it easier to obtain information on the goods exchanged or on the opposite party, thus reducing transaction costs" (Brunsson, 2000, p. 30)[94].

However, there are also different aspects to transaction costs: "While transaction costs may increase with asset specificity, they will also vary independently of asset specificity" (Dyer, 1997, p. 539). Especially the other two dimensions of uncertainty and frequency of transactions developed by Williamson (1985) are also addressed by Dyer and Singh (1998). Thus, it can be concluded from the theoretical discussion of agency theory that uncertainty has to be reduced in order to reduce potential frictions in the networked organizational structure. As Eisenhardt (1989a) has convincingly argued, crafting mechanisms that increase the information that the involved parties have over each other is a possible lever to reduce agency costs in the network. Only if the participants in the network have as close as possible to correct knowledge about their partners' intentions, their behavior, and the outcomes of their work, smooth cooperation in the network can be ensured. Thus, creating mechanisms that allow for a transparent and open management of relationships is a necessity in the network.

[94] Brunsson (2000, p. 30) also mentions what has been considered highly important for this work - that "the absence of common standards may even prevent markets from arising." This is exactly what has been argued as being the state of the IS development industry before the emergence of SOA. Interactions between components have been possible only if a point-to-point connection has been established. Since the involved interfaces have not been standardized, the components of one system have all been developed by one organization.

Finally, relationships can be deliberately managed in such a way to decrease the likelihood of frequently changing partners. The idea that relationships should be guided by an incomplete contract, which allows for future accommodations to changed environments has been discussed as part of the last theoretical perspective of this section. This has also been addressed in the relational view. As Dyer (1997) notes, upfront investments for establishing a good relationship between network participants might be higher than those for writing an extensive legal contract. However, as these investments "can control opportunism over an *indefinite time horizon*" (p. 548, emphasis in original) they are especially suited for realizing long-lasting relationships. This long-lasting nature of relationships has been explicitly demanded by both Demsetz (1988) and Alchian (1998) in order to ensure a smooth cooperation between the involved parties. That these good relationships between organizations are best realized through close personal interactions between the involved individuals of the various participating organizations has been described for example by Hamel et al. (1989).

These three broad categories of mechanisms are assumed to be used in order to successfully manage an IS developing network that is facing considerable behavioral issues. However, as it has been argued, these behavioral issues are only one reason why such network relationships merit careful management. The other reason is seen in the inherent complexity to integrate components developed by various independent organizations within the network. These complexity issues can arise independently of behavioral issues whenever complex interactions in-between various entities are required. So, before dwelling more on the details of how behavioral issues can be countered in the network, first these complexity issues are discussed. In a subsequent step, the here touched upon mechanisms for reducing behavioral issues are then discussed in detail and also compared with those that are proposed for the complexity issues.

2.3.2 Complexity Issues in Inter-Organizational Networks

Besides those issues that stem largely from the behavioral uncertainties of partners in the network, there are also those issues that stem from the inherent complexities within the network (and to a lesser extent from behavioral uncertainty). These complexities largely exist because of interdependencies within a group of organizations that is conjointly developing a comprehensive system. To gain a clearer understanding of the nature of these interdependencies, again theoretical concepts are introduced that discuss its underpinnings in an organizational context. As Victor and Blackburn (1987) argue, there are essentially two distinct, yet related perspectives on the issue. The first of these perspectives is the *resource dependency theory* (Pfeffer and Salancik, 1978). This discussion also entails details about the concept of *power*, which is proposed to be the counterpart of dependence. This theory well aligns with the flow of this study for two reasons. First, it resumes the above conducted discussion on resources endowments of participating organizations, in that it considers these resources as a key source of

power. Second, it connects behavioral concerns with coordination concerns in that it uses behavioral uncertainties to emphasize the importance of dependencies in inter-organizational relationships.

As the following discussion on resource dependency theory shows, inter-organizational power (and thus dependence) has to be considered as a reciprocal relationship. This leads over to the discussion of a second perspective on organizational *inter*-dependencies. In this context, Thompson (1967) analyzes multiple resource exchanges between entities and classifies these resource flows into three distinct groups. Similar to other works in this area (e.g. McCann and Ferry, 1979) he argues that depending on the complexity of these resource flows, interdependencies are becoming more or less intense, and thus cause a varying degree of necessary coordination effort. Both approaches are still widely used in more recent literature (e.g. Malone and Crowstone, 1994; Gulati and Singh, 1998) and are thus introduced as fundamental theories for this study. However, the degree of interdependence is - albeit an important one - only a first step in the discussion of organizational coordination. Building on this degree of interdependence, various typologies of coordination instruments have been proposed in the literature (e.g. March and Simon, 1958; Thompson, 1967; Van de Ven et al., 1976). These are discussed subsequently in order to establish a clearer understanding how these (more or less) complex interdependencies can be managed. As these are discussed, it becomes obvious that they closely mirror those mechanisms that already have been discussed as addressing behavioral issues. Thus, this section closes with applying both typologies to the IS context and developing propositions how the emerging network in this industry can be managed.

2.3.2.1 Theories on Organizational (Inter-)Dependence

Referring to the name of the theory, resource dependency theory is closely related to the resource-based theories that have been discussed in Section 2.2.1.1. Extending the perspective on organizations that have to gain access to some of the resources they use from third parties, resource dependency theory addresses various aspects of this resource acquiring process (Pfeffer and Salancik, 1978). Since organizations can be considered *open systems* (Katz and Kahn, 1966) they have to interact with other organizations to obtain some of the resources they need for survival. However, these other organizations tend not to be very reliable[95]. Pfeffer and Salancik describe the difficulties that arise from the dependence on others and the uncertainty concerning their reliability as follows:

> The fact that organizations are dependent for survival and success on their environment does not, in itself, make their existence problematic. If stable supplies were assured from the sources of needed resources, there would be

[95] Please note that this does not indicate that the other organizations have to behave opportunistic. This aspect of unreliability has been covered in the preceding section. Rather, in the here discussed context, organizations areassumed to be unreliable because they interact in a complex way which requires intense coordination as it is discussed below.

> no problem. If the resources needed by the organization were continually available, even if outside their control, there would be no problem. Problems arise not merely because organizations are dependent on their environment, but because this environment is not dependable (Pfeffer and Salancik, 1978, p. 3).

As the name implies, the issue of dependence is playing a pivotal role in the here discussed theory. However, before addressing this issue, it is reasonable to first discuss the underlying principles of *politics* and *power*. As the following two definitions show, both concepts are highly interrelated, which explains that a discussion of one of the concept can only be successfully conducted in conjunction with the other. Politics in an organizational context can be defined as "the structure and process of the uses of authority and power to affect definitions of goals, directions, and major parameters of the organizational economy" (Wamsley and Zald, 1973, p. 18). Since power is part of the definition of politics, this concept also has to be defined. This is done "here as the potential (or capability) of an actor to influence the behavior of another actor in a particular issue area" (Tushman, 1977, p. 207)[96]. In the strictly intra-organizational understanding of these concepts, political processes take place between "differentially powerful subgroups [of an organization] as they vie for scarce resources and cooperate on tasks which require mutual coordination" (Tushman, 1977, p. 210). While this definition of power and politics is inherently intra-organizational[97] there is also a broader understanding of power in-between organizations.

This understanding is on the one hand based on the perception of politics as the process of allocating scarce resources within and in-between organizations (Pfeffer and Salancik, 1974; Tushman, 1977; Pettigrew, 1975). On the other hand, it is based on the reciprocity of social relations, especially on the fact that "the power of A over B is equal to, and based upon, the dependence of B upon A" (Emerson, 1962, p. 33). This definition indicates that power does not necessarily show in interactions between A and B. Rather, it is a latent concept that only emerges when A demands something of B which runs counter to B's desires. Furthermore, power in the definition of Emerson (1962) can be considered the opposite of *dependence*. If A has power over B, B is dependent on A. However, it is important to note that in the definition by Emerson (1962), power of A over B does not by necessity has to be neutralized or cancelled out by power of B over A. For example in the case given by Pfeffer and Salancik (1978, p. 53), in which one organization is buying the entire output of another organization and nothing else, both organizations clearly depend on each other. One on its sole supplier, the other

[96] This definition goes back to the definition of power by Max Weber (1964, p. 38): "Macht bedeutet jede Chance, innerhalb einer sozialen Beziehung den eigenen Willen auch gegen Widerstreben durchzusetzen." (Power means every opportunity to enforce one's will within a social relationship, even against resistance). Definitions by other prolific authors differ only marginally from this one (see for example Dahl, 1957; Emerson, 1962; Mintzberg, 1983; Pfeffer and Salancik, 1974)

[97] See for example also Zald (1970) for some excellent works on the issue of intra-organizational power.

on its sole customer. Rather than removing power from this relationship, the power is *balanced*. In the extreme example above, "it might even be meaningful to talk about the parties being controlled by the relationship itself" (Emerson, 1962, p. 34). Therefore, real power of one organization over another results from imbalance, or asymmetry in the relation, which "derives from its discretionary control over resources needed by that other and the other's dependence on the resource and lack of countervailing resources or access to alternative sources" (Pfeffer and Salancik, 1978, p. 53).

When applying these concepts to an inter-organizational context, cooperating firms are to some extent dependent on the scarce resources that they supply each other with. Obviously, in such a context of different organizations, each possessing and being responsible for its own distinct set of resources, compromise, accommodation, and bargaining between these play an important role. Since these different organizations are all legally and - in part - economically independent, they all might have different perceptions how to reach a common goal, or how to share scant resources. Thus, conflict emerges between the different groups. In this context, it has been argued that the power one organization has over another (and thus the dependence of the second organization) is influenced by three factors: Resource importance, discretion over resource allocation and use, and concentration of resource control[98] (Pfeffer and Salancik, 1978, p. 47 ff). The first factor indicates that some resources are more important than others. Only those that are critical for a client's survival are a source of power for the supplier. The second factor addresses the capacity to decide on the use of the resource. Legal requirements for example might prevent an organization to freely decide on how to put the resource to use. Such a restricted resource is no real source of power. Finally, resource control needs to be concentrated in a few hands. If a client can easily find a substitute for a certain resource, it also cannot be considered as a source of power.

In this context, the main argument is that "organizational success in the resource dependence perspective is defined as organizations maximizing their power" (Ulrich and Barney, 1984, p. 472). Since organizations are competing for scarce resources, which they need for survival, power can be maximized essentially in three ways, which correspond to the above given underlying factors that influence the power base. An organization can reduce the importance that a single resource has for its operations. Furthermore, an organization can use discretion over resources through two ways: Either it strives for attaining control over resources that others depend upon, thus maximizing the power it has over others, or it strives for attaining resources that it depends upon, thus minimizing the power others have over the organization. An organization can also increase its power through strengthening its dominance in exchange relationships, and thus improving the control it has over resources others supply it with (Pfeffer and Salancik, 1978, p. 113). The most promising approach that Pfeffer and Salancik (1978) mention for

[98] The close relation between the resource-based view and resource dependency theory can be seen from the close match of these factors to the the VRIN attributes of the resource-based view (Medcof, 2001).

these three strategies is organizational *growth* - either through mergers and acquisitions or organically. *Diversification* growth refers to growth in a business in which the focal organization is neither involved, nor with which it has direct relations. Through such a diversification strategy, an organization is able to reduce the dependence on other organizations. *Vertical* Growth, i.e. in up- or downstream positions in the supply chain, is supposed to increase the discretion an organization has over critical resources. Finally, *horizontal* growth, that is expansion in the field of business the organization is already operating in, is an appropriate way to improve the bargaining position vis-à-vis suppliers and customers[99].

These three factors have also been elaborated on by other authors. McCann and Ferry (1979) for example argue for a six dimensional classification of interdependencies. The first dimension is the *number* of different resources that are exchanged between the entities; second, the degree of interdependence varies with the *amount* of a certain resource exchanged; third, the *frequency* with which resources are exchanged is an important determinating factor for dependency; fourth, the *amount of time* that passes before the missing resource has a significant impact on the organization plays a role in the degree of dependence; fifth, the *value* of a resource is important[100]; finally, the *direction* of the resource flow is crucial.

While the first five of these dimensions seem to be a more detailed analysis of resource importance, the last point adds another perspective. Thus, it has to be stated that the structure of interdependence between organizations is highly important. In this context, the mostly applied classification of interdependencies is that of Thompson (1967), which today still is the standard when it comes to classifying interdependencies, not only in intra- but also in inter-organizational settings (e.g. Malone and Crowstone, 1994; Gulati and Singh, 1998; Van de Ven et al., 1976). Thompson (1967) distinguishes between three types of (task) interdependencies, with the more complex ones building upon simpler ones. The first, and most simple, type of interdependence is labeled *pooled* interdependence. It indicates that involved parties either contribute their task output to, or take their task input from a shared pool of resources. The interdependence in this setting is relatively low, coordination and communication efforts are almost nonexistent. As long as the resource is not exhausted, any party can be removed, or replaced from

[99] Since - at least from a resource dependence viewpoint - all organizations necessarily have to follow this strategy, Emerson (1962) argues that the entire system is developing towards a power balance. This has also been addressed by Galbraith (1997, p. 113) through the concept of *countervailing* power: "Power on one side of a market creates both the need for, and the prospect of reward to, the exercise of countervailing power from the other side." At the heart of this concept is the idea that a concentration of power at one end of a relation tends to induce power concentration on the other end, too.

[100] McCann and Ferry (1979, p. 114) subsume the following four factors under resource value: "(a) the cost of substituting a different resource; (b) the cost of locating another supplier or user; (c) the qualitative importance of the resource for achieving desired work outcomes; (d) the percentage of the time unit needs were satisfied in the past by this unit."

the setting without any significant influence on the overall system. An example of this type of interdependence would be teachers who use common facilities but teach their students independent of each other (Mintzberg, 1979b).

The second type of interdependence is *sequential* interdependence. In this setting, the output of one party's task is at the same time the input for the task of another party. Obviously, this is a more intense type of interdependence, in which coordination and communication has to be higher than in pooled interdependence. In order to guarantee a smooth flow of resources, the involved parties have to reach a consensus when and how the resource delivery is supposed to happen. In case that a preceding task encounters any problems, the later stages are severely impacted. A typical example for this type of interdependence would be the assembly line. Those workers that attach the wheels to the car have to wait for those that attach the axis, which in turn have to wait for the delivery of the chassis.

The final type of interdependency is *reciprocal* interdependency. This parallels sequential interdependency in that the task output of one party is the task input of another party. However, the output of this second party is then again the input of the first. So, the involved parties interact in an ongoing loop, until finally some desired end state of the resource is reached, and the interaction ceases. This type of interaction can be considered the most intense. In contrast to sequential coupling, in case of any difficulty at any stage of the process, all parties, even those active before the actual problematic task, are affected. Most complex processes involve reciprocal coupling at some stage. Thompson (1967, p. 55) mentions the operation and maintenance of an airline as an example: "The production of the maintenance unit is the input for operations, in the form of a serviceable aircraft; and the product (or by-product) of operations is an input for maintenance, in the form of an aircraft needing maintenance." The different structures of these types of interdependency are illustrated in Figure 2.15.

As has already been implied above, coordination effort increases from pooled, over sequential, to reciprocal interdependence, and thus "we will say that they are more costly to coordinate, noting that measurement of such costs is far from perfect" Thompson (1967). However, coordination costs are not a fixed sum that depends on the intensity of interdependencies. Rather, a higher degree of interdependence calls for different coordination mechanisms that tend to be more costly. Exactly what types of coordination mechanisms are available to organizations, how costly they are, and how they relate to the three distinct forms of interdependence is discussed subsequently.

2.3.2.2 Approaches to Coordination of (Inter-)Dependence

As coordination is one of the two essential building blocks for larger organizations, it has been widely studied throughout the history of organizational science. One of the most influential discussions on ways and means for coordination is the work of March and Simon (1958). They argue convincingly that there are essentially two types of coordination: *coordination by plan* and *coordination by feedback*. The first refers to the

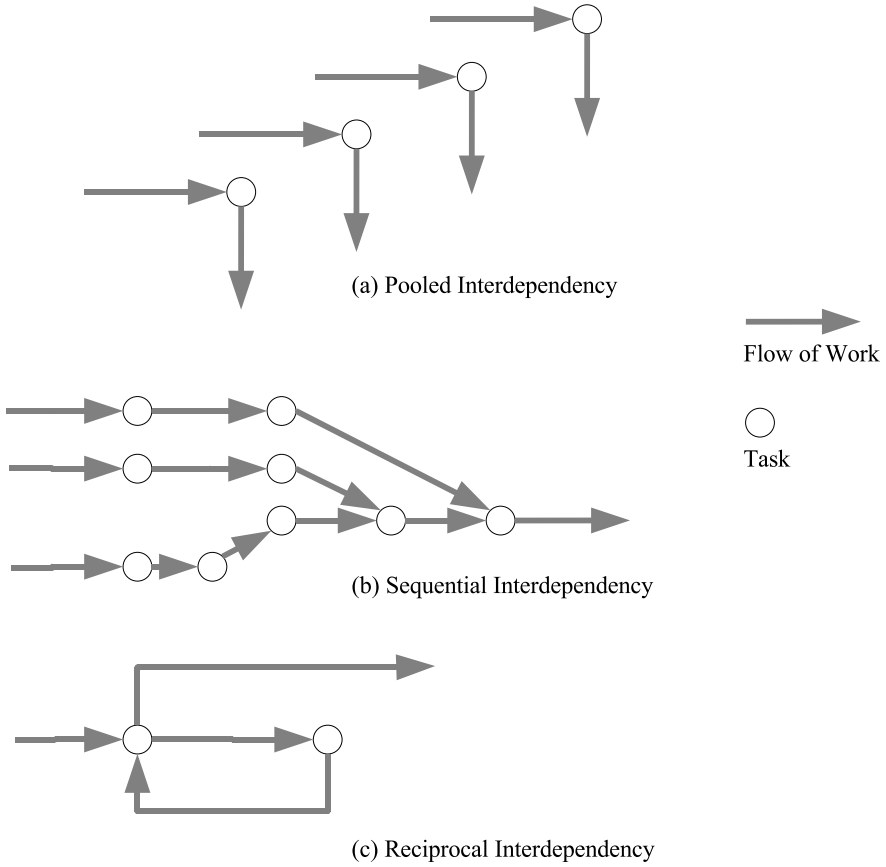

Figure 2.15: Pooled, Sequential, and Reciprocal Interdependencies.
Source: Based on Mintzberg (1979b, p. 23).

idea that coordination is achieved through a pre-established plan, while in the latter case, coordination is achieved through transmission of new information in a changed environment. Which of these two types of coordination is appropriate in a given situation depends on the stability of this situation: "The more stable and predictable the situation, the greater the reliance on coordination by plan; the more variable and unpredictable the situation, the greater the reliance on coordination by feedback" (March and Simon, 1958, p. 160). In this context, March and Simon (1958) further argue that coordination by plan is more desirable, as it is less costly, and thus organizations strive for increasing stability in their environment. They propose two distinct means for achieving this goal[101]. The first is standardization. If the exchange relationship between two entities is highly standardized, the need for intense feedback coordination with the supplier of this

[101]Actually, March and Simon (1958) propose *three* devices: standardization, use of interchangeable parts, and use of buffer inventories. However, as the use of interchangeable parts can be assumed to be closely related to standardization (see for example the discussion on the bicycle industry in Section 2.1.2.3) these two are subsumed under the heading of standardization.

input can be substantially reduced. This fact has been found to be especially important for information goods (Gheihs et al., 2002; Weitzel, 2004). The second is the use of buffering inventories. If in case of a disturbance of its partners, an entity can proceed (at least for a certain time) without feeling the effects of this disturbance, the need for feedback coordination is less distinct.

In this context it is also interesting to note the close relation between the ideas on coordination of March and Simon (1958) and those on interdependence of McCann and Ferry (1979). Emery (1969) argues that a reduction of the necessary amount of coordination between two entities should first be based on reducing the *number*, *amount*, and *direction* of interchanged resources. All these aspects have also been raised by McCann and Ferry (1979) as drivers for interdependence. However, when this is not possible, standardization and buffering should be used. These two approaches address the remaining three aspects of dependency that have been discussed by McCann and Ferry (1979). Through standardization, for example the costs of substitution or the costs of locating another supplier, as important parts of the *value* of an interchanged resource can be significantly reduced. Similar, through buffering, both the necessary *frequency* in an exchange relationship, as well as the *amount of time* that passes before a missing resource has a significant impact can be reduced.

The above-mentioned distinction between coordination by plan and coordination by feedback has also been adopted by Van de Ven et al. (1976, p. 323), who argue that the first actually refers to *impersonal* coordination: "Coordination by [plan] is a clear construct exemplified by such integration mechanisms as the use of pre-established plans, schedules, forecasts, formalized rules, policies and procedures, and standardized information and communication systems. The common element of each of these exemplary mechanisms is that a codified blueprint of action is impersonally specified." In contrast to this, coordination by feedback involves personal relationships between individuals either on a one-on-one basis, or within a group. This distinction between personal and impersonal coordination is also addressed by Mintzberg (1979b). He argues for a classification in three distinct types of coordination: *Mutual Adjustment*, *Direct Supervision*, and *Standardization*. The first two refer to *personal* coordination. Mutual adjustment is coordination through the (in part informal) communication between peers. In contrast, direct supervision is coordination through one appointed responsible individual. It "achieves coordination by having one individual take responsibility for the work of others, issuing instructions to them and *monitoring* their actions" (Mintzberg, 1979b, p. 4, emphasis added). Standardization has already been discussed and refers to more impersonal, formalized coordination. Mintzberg (1979b) argues that standardization can be achieved on three layers: Standardization of processes, of outputs, or of skills. These different approaches are illustrated in Figure 2.16.

It is now one of the main arguments of Mintzberg (1979b, p. 7), that "as organizational work becomes more complicated, the favored means of coordination seems to shift (...) from mutual adjustment to direct supervision to standardization, preferably of work processes, otherwise of outputs, or else of skills, finally reverting back to mu-

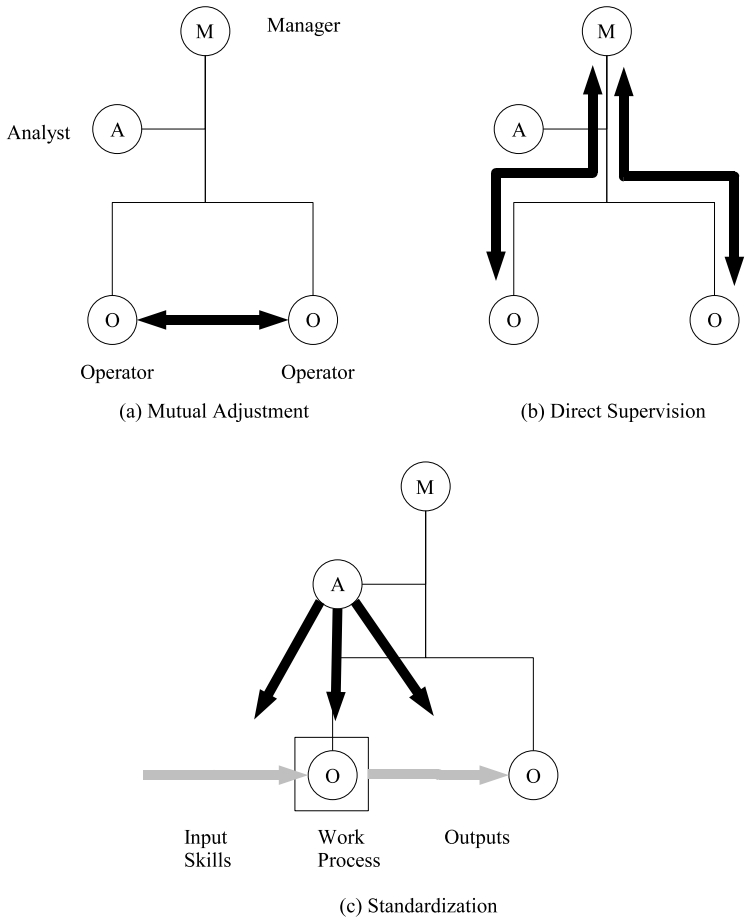

Figure 2.16: The Five Coordination Mechanisms.
Source: Based on Mintzberg (1979b, p. 4).

tual adjustment." Mintzberg (1979b) illustrates this development with the example of a growing organization. An organization that only consists of a handful of people can be easily coordinated by mutual adjustment, the members simply agree to who is doing what, when, and how. However, as soon as the organization grows beyond a certain size, this coordination mechanism is no longer viable. Rather, a supervisor is introduced whose responsibility it is to coordinate the growing group through issuing commands to and monitoring of the group members. However, as the span of control of individuals is limited, the coordination of the growing group soon overburdens the supervisor, he is simply unable to coordinate the behavior of too many organizational members. Rather than coordinating them on a continuous basis, he sets certain standardized rules that guide the behavior of the individual members of the organization. However, in case that the organization becomes even more complex, and especially if the constituents of this organization specialize in very narrow fields of expertise, the coordination mechanism

of choice is again mutual adjustment: "Sophisticated problem solvers facing extremely complicated situations must communicate informally if they are to accomplish their work" (Mintzberg, 1979b, p. 8). While Mintzberg (1979b) has focused on the size of the organization, Van de Ven et al. (1976) show that essentially the same holds true for an increasing degree of interdependence between organizational tasks. This continuum is illustrated in Figure 2.17.

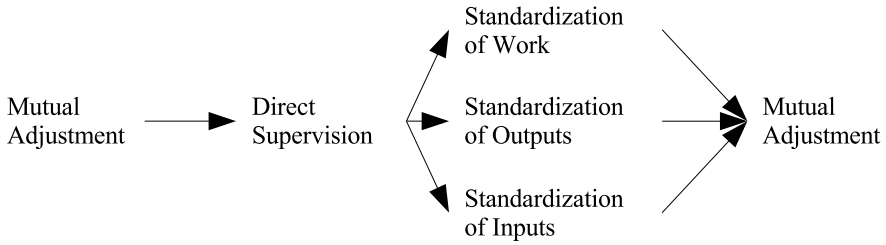

Figure 2.17: The Coordination Mechanisms: A Rough Continuum of Complexity. Source: Based on Mintzberg (1979b, p. 7).

However, the insights drawn from the preceding discussion of coordination are limited with regard to one aspect: They have focused on coordination *within* one organization. However, as the present work explicitly addresses issues in inter-organizational processes, this background has to be considered in the discussion of approaches to coordination of interdependencies. Discussing the issue of inter-organizational coordination Smith et al. (1995, p. 11) note that this coordination does not differ that much from the coordination of intra-organizational relationships, and that consequently "macro researchers can probably learn much about cooperation from past and current studies at the micro level." Consequently, Van de Ven (1976, p. 33) also studies inter-organizational relations and finds, similar to intra-organizational ones, that standardization is the preferred coordination mechanism, but that personal coordination indeed becomes necessary, whenever the standardization approach is not feasible: "An immediate response to the problem [of increased interaction] is to increase the frequency of communications between agencies through personal contacts and committee meetings. But personal contacts and committee meetings absorb much time and effort and are inefficient mechanisms for coordinating activities that can be standardized." This parallel existence of formalized and informal and personal and impersonal relationships has been later affirmed, albeit with the note of caution that personal relationships might be formal or informal (Van de Ven et al., 1979). Van de Ven and Walker (1984, p. 598) also emphasizes the importance of the informal, personal type of coordination mechanism "not only because of its pervasiveness, but also because it often represents the embryonic stage in the development of [inter-organizational relationships]."

This distinction is upheld to some extent throughout the following decades. In their meta-analysis of 32 empirical studies published between 1987 and 1994 Sobrero and Schrader (1998, p. 607) for example find support for their "distinction between contractual and procedural coordination mechanisms as two separate and complementary dimensions for the structuring of inter-firm relationships." As Sobrero and Schrader (1998) note, procedural coordination refers to the structuring of day-to-day relations between involved organizations' employees. Thus, albeit some formal structure is possible and necessary in these relations, the main focus lies on the actual behavior of the individuals, and inherently personal issue. Hamel et al. (1989, p. 136) also recognize this, when they bluntly state that "top management puts together strategic alliances and sets the legal parameters for exchange. But what actually gets traded is determined by day-to-day interactions of engineers, marketers, and product developers." In contrast to the latter part of this statement, the first obviously refers to contractual coordination. In this view, the differentiation of Sobrero and Schrader (1998) is interesting, as it goes beyond the mere distinction between formal and informal or personal and impersonal relations. The (main) goal of contractual coordination is the structuring of what is exchanged in the relation between the involved parties. In this regard, it is closely related to the division of labor that has been discussed in the previous section. The demand for a conjoint analysis of both aspects put forth by Sobrero and Schrader (1998), is thus a further support of the broad research approach followed in this study that addresses both the reasons for partnering in the IS development industry as well as mechanisms for realizing it.

2.3.2.3 Implications for Network Management

This discussion on coordinating inter-organizational dependencies has shed more light on the second research objective to understand how such an inter-organizational network is supposed to be managed in the IS development context. It has complemented the preceding discussion in that it has shown that difficulties in the management of such relationships can emerge from the complexity of the relationship in itself - and not necessarily only from behavioral issues. This discussion has also contributed to this research objective in that it has developed a broad classification of three mechanisms that promise to help organizations in this context to effectively manage their network relationships.

First, it has been argued that coordination can be achieved through standardization. If participants in an inter-organizational network can agree upon certain standards for processes, products, or skills, coordination can be achieved through these standards in an impersonal way. Through this mechanism the coordination costs for the participating organizations can be substantially reduced. Furthermore, the reliance on such standards can also increase the stability of environment within which the organizations interact to a significant degree, which is also a desirable goal. Albeit this standard-setting in

the first place requires a considerable effort, this investments promises to allow for an on-going coordination. Therefore, reliance on standards is often perceived to be the ideal coordination mechanism.

Second, supervision can be a mechanism for coordination. This involves one entity that takes on responsibility for the others. In the inter-organizational context, supervision is difficult to achieve as the organizations participating in the network are assumed to be legally and economically independent of each others[102]. Thus, one party instructing the others is exactly not possible. However, in the definition of Mintzberg (1979b), supervision not only involves *instruction*, but also *monitoring* of the other parties. Through this monitoring the network can be made more transparent, which promises to be key in coordinating the inter-organizational network. In contrast to standardization, monitoring requires continuous investments. Therefore, it is perceived to be a less ideal coordination mechanism, yet one that is necessary if the task to be coordinated becomes more complex.

Finally, in parallel to these two coordination mechanisms, an appropriate way for achieving coordination can be through mutual adjustment. Especially in very complex settings, only individual communication (which in part also will be informal) can ensure that the involved parties can cooperate in a smooth way. As this mutual adjustment involves considerable effort by all the involved parties it is perceived to be even more costly than monitoring. However, here again, for some tasks this investment seems to be inevitable.

As the discussion above has shown, it is assumed that managing complex inter-organizational relations can best be achieved through these three mechanisms. As it has also been argued, IS development is an inherently complex endeavor, which involves a certain degree of reciprocal dependencies. Following Thompson (1967), it thus also involves sequential and pooled interdependencies. As Mintzberg (1979b) has argued, highly complex interactions are best coordinated by mutual adjustment, while less complex interactions are best coordinated through direct supervision or through standardization. As IS development includes all three aspects, all three types of coordination mentioned by Mintzberg (1979b) promise to be fruitfully applicable in this context. Interestingly, these three mechanisms are also very close to those that have been proposed as counter-measures for behavioral issues. There, the reduction of asset specificity through the use of standards has been proposed as key for reducing transaction costs. Also, the use of monitoring devices in order to increase the transparency in the network has been proposed as key for minimizing agency costs. Finally, incomplete contracts, which require a certain adjustment to relationships as environments change over time, have been proposed as a requirement for realizing the benefits of long lasting relationships. As these three aspects have been emerging from both the behavioral

[102]Especially in the context of incomplete contracts this has been a key requirement.

and the complexity perspective, they are subsequently discussed and proposed as dominating management mechanisms especially in the context of the inter-organizationally networked IS development industry.

2.3.3 Proposed Inter-Organizational Management Mechanisms

Giving an answer to the second research question, how organizations manage their relationships with other network participants, has so far been approached on the basis of behavioral and complexity issues in such a network. These two threads of theoretical arguments have led to proposition of three close to identical broad categories of management mechanisms: *standardization*, *monitoring*, and *personal relationships*. These three categories of mechanisms are promising to contribute to a smoother cooperation in the inter-organizational network in such a way that potential frictions do not offset the proposed benefits that have been developed in the preceding section. It is therefore the goal of the present section to discuss the broad categories especially in the light of the IS development context.

In contrast to the propositions that have been developed for answering the first research question, the here discussed proposed management mechanisms are not differentiated between the hubs and the spokes in an inter-organizational network. An underlying rationale for this decision can again be found in the concept of the relational view. In their work, Dyer and Singh (1998) explicitly argue that investments into relationships by *all* involved entities are necessary to ensure a smooth cooperation. Obviously, the hub organizations nevertheless are expected to invest more into these relationship management mechanisms - this, however, simply due to the fact that because of their size and their central role in the network they are expected to have many times more relationships than smaller spokes (Lorenzoni and Baden-Fuller, 1995). If this assumption can be help up will be shown by the empirical data.

2.3.3.1 Management through Standardization

As it has been argued above, standardization promises to address both behavioral and complexity issues (Brunsson, 2000). According to transaction cost theory, in a non-specific (i.e. standardized) exchange relationship the thread of opportunistic behavior is curbed (Williamson, 1979). The same has been brought forward by scholars of coordination theory. The reliance on standards reduces the need for on-going coordination significantly, as coordination is achieved before the actual work is done (March and Simon, 1958; Mintzberg, 1979b). Therefore, standardization is also perceived to be the least costly coordination approach. Consequently, standardization is also considered highly important in the context of inter-organizational IS development. How standardization can influence the relationship between the various participants in this specific organizational network is discussed subsequently.

As Mintzberg (1979b) argues, coordination through this mechanism is based on the standardization of outputs, of processes, or of skills. It can be assumed that all three aspects are actively pursued in the IS development network. So, outputs of partners (i.e. the software they are developing) can be standardized through the reliance on technical standards, which in part have already been briefly touched upon in the context of the concept of Service-Oriented Architecture. The fact that the wide-spread adoption of SOA principles leads to a certain degree of standardization within the IS development industry has already been discussed in Section 2.1.2.4. As it has also been noted there, it is exactly not the focus of this work to give another discussion on the technical perspectives of SOA. Consequently, these are not covered in-depth in this section. However, the impact that SOA has on the industry is of such magnitude that it has to be mentioned in order to gain a better understanding of the management of the inter-organizational relationships. As it has also been mentioned in Section 2.1.2.4, SOA does not refer to a single technology, but rather to a definition of an integrated architecture for complex IS. This integration is achieved largely through Web Services, which are interconnected through a *stack* of standards, such as those that have been mentioned in Section 2.1.2.4. An exemplary, and thus necessarily partial, overview over this Web Services stack is given in Figure 2.18.

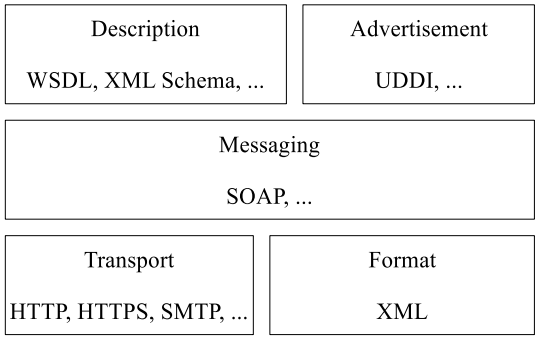

Figure 2.18: A View on the Web Service Stack.
Source: Adapted from Barros et al. (2005, p. 1).

In this context, it is especially crucial to note that the above described Web Service Stack is not developed by an IS development company. Rather, it is developed by the *World Wide Web Consortium* (W3C[103]). This organization is operated by various member organizations which have in part dedicated full-time staff to conjointly work with the interested public in order to develop standards as those described here[104]. In the W3C there is also a work group on "Web Services Architecture," which is responsible

[103]The information on the W3C is based on the organization's web site: www.w3.org. It has been last accessed on Monday, May 14th 2007.

[104]This is essentially a very common approach to define standards. See Hallström (2000) for a discussion of such standard setting bodies.

for the definition of the general Web Service Stack. This work group bases its work on that of other - similar - work groups, which are for example responsible for defining the SOAP protocol, or XML[105] specifications. This already indicates that the work of this organization is an important underpinning of the change in the IS development industry. However, at the same time it also indicates that it is easily within the scope of a book in its own right to study only one of these specifications. As it has been argued, discussing these technological backgrounds is therefore clearly beyond the scope of this study. However, what is within the scope of this study is the recognition that the wide adoption of standardized Web Service technologies is one of the fundamental pillars for the organizational change that is discussed here (Kreger, 2003).

Parallel to this standardization of outputs, skills can be standardized. This approach is obviously closely related to the preceding one, as the standardization of outputs (for example in the sense of SOA compliant software) requires certain skills. Thus, only through the availability of these skills in the network, the above discussed standardization of outputs can be successful. Kieser (1989) argues in this context, that one of the possible explanations for the emergence of guilds in the medieval ages is the standardization of first outputs and then procedures. This standardization of skills is today even more important - particularly in the highly specialized field of IS development (Rada, 1999). Consequently, the participating organizations have considerable incentives to acquire standardized skills in contrast to proprietary ones, especially because these standardized skills are actively promoted by such organizations as for example the W3C Ahrne et al. (2000). However, it should also be noted that acquiring the standardized skills promises to be much less challenging than acquiring proprietary skills. This especially because the educational system can adjust to the requirements of standardized skills much more easily than to that of proprietary ones.

The final aspect in which standardization can be used in order to minimize coordination expenses are processes. Especially the processes which regulate the relationships between the involved parties in the network can be standardized. This standardization of processes has been well addressed in the field of *virtual team* research. Research in this field indicates that "in particular, formal processes must be developed" for successful cooperation in virtual teams (Lurey and Raisinghani, 2001, p. 532). "Through the use of well defined processes and semantically rich media that clarify, extend and constrain meaning," a loose coupling between virtual team members can be achieved (Ramesh and Dennis, 2005, p. 1). Again referring to the findings of Smith et al. (1995), that the mechanisms for intra-organizational relationship management are at least in some aspects similar to inter-organizational ones, it is thus argued that relationships in the IS development network can be managed at low cost through the use of standardized processes that guide the relationships between these organizations. This is well reflected in the fact that inter-organizational supply chains are also found to be influenced by the

[105]The *Extensible Markup Language* (XML) is a standardized language for the hierarchical structuring of data in text files.

availability of standardized processes (Simatupang et al., 2002; Subramani, 2004). All these standardization mechanisms promise to significantly reduce the coordination expenses of organizations interacting in the network. This is summarized by the following proposition:

> *Proposition Std.* Both large IS producers (hubs) and smaller software producers (spokes) invest into standardized products, skills, and processes in order to manage their relationship(s)[106].

As it has been discussed above, other, more costly, management mechanisms are also utilized in the IS development network. These are therefore subsequently discussed. First, management through (formal) monitoring is discussed in the following section. The last aspect, standardized processes, already leads over to this next proposed management mechanism. As the relationships within the IS development network promise to be mainly based on the exchange of information (this because IS are inherently *information goods*), the use of formalized information sharing (monitoring) processes[107] plays a pivotal role. It is recognized that standardization of information sharing routines is important. Therefore, this dimension is discussed in detail in the following section.

2.3.3.2 Management through Monitoring

Parallel to standardization, monitoring promises to be the second management mechanism used in the IS development network. From a behavioral perspective, monitoring increases the information that the involved organizations have over each other, and therefore reduces the uncertain, yet possible opportunistic behavior. Form a complexity standpoint, this relationship is less distinct. However, it has to be noted that monitoring is seen as a substantial part of supervision. In the context of the networked IS development industry supervision in the original meaning of the concept, that is taking responsibility for the work of others, issuing instructions to them, and monitoring their actions, is not feasible (Mintzberg, 1979b). This especially as the legal and economic independence of the involved organizations has been given as one of the prerequisites for realizing the proposed benefits of this approach (see Section 2.2.3). Yet monitoring as partial supervision promises to be successfully applicable in the inter-organizational IS development context. Thus, this mechanism again helps to counter both uncertainty that arise due to behavioral and complexity issues within the network.

[106] It is acknowledge that this proposition is at this point in time still left very open-ended. This is intentionally so, as the goal of this exploratory study is in part to determine more exactly what type of standardizations are used by the network participants to manage their relations. As any preliminary constraint to this proposition could potentially exclude some of these mechanisms, the entire scope of standards as proposed by Mintzberg (1979b) are included.

[107] Emery (1969, p. 35) recognized the necessity to standardize information sharing systems early on, when he stated that "an informal system is a fickle crutch. It contains too many unreliable and "noisy" channels for the organization to depend on it as an avowed policy. An information source should therefore be formalized whenever possible."

This distinction between uncertainty due to behavior and complexity has been well researched in the literature on this topic. Milliken (1987) argues that uncertainty is not a uni-dimensional concept, but that different aspects of uncertainty should be considered. Sufcliffe and Zaheer (1998, p. 3) for example discuss different sources of uncertainty: Uncertainty stemming from the behavior of either competitors or suppliers and what they call "*primary* uncertainty [which] appears to subsume technological uncertainty, or the uncertainty arising from changes in technology due to new inventions or discoveries." This differentiation seems to be very close to the distinction between behavioral and complexity reasons for uncertainty. The latter type of uncertainty is, in contrast to behavioral uncertainty, actually *negatively* associated with vertical integration. Thus, their study supports an earlier one conducted by Balakrishnan and Wernerfelt (1986, p. 358) that "integration is affected negatively by the frequency of technological change." Recent research on transaction cost economics has also shown the distinction between *behavioral* and *technological* uncertainty. While the first promotes hierarchical integration, the latter leads to market governance (Geyskens et al., 2006). The rationale for this difference can be found in a strategic approach to vertical integration. Harrigan (1984, p. 638) argues that "effective vertical integration strategies need to reflect (...) corporate level strategy requirements." Thus, organizations tend to vertically disintegrate in order to realize a high degree of strategic flexibility (Sanchez, 1993), if no strategic objectives contradict this approach[108]. Among the most salient strategic factors that stimulate an integration are "the need to protect product quality, proprietary knowledge, or manufacturing integrity" (Harrigan, 1985, p. 406).

Thus, in the (technologically) uncertain IS development environment, organizations are theoretically inclined to vertically integrate because they feel the pressing need to achieve exactly these strategic objectives such as developing high-quality systems, protecting proprietary knowledge, or ensuring manufacturing integrity. However, if these participants in such an inter-organizationally structured IS development industry could ensure these objectives without vertical integration, they would, due to the technological uncertainty, vertically disaggregate to a larger extent. The fact that monitoring can be useful for achieving exactly this goal has been recognized as part of the *relational view*. Dyer and Singh (1998) argue that information-sharing routines are an integral part of the design of inter-organizational relationships. Only through these routines, the relationships can be realized in a transparent way. Thus the effects of this vertical disaggregation, negative due to behavioral uncertainty and positive due to technological uncertainty, can be minimized respectively realized. Subsequently it is discussed how these information sharing routines can be applied in the IS development context, following along the lines of ex ante and ex interim uncertainty as it has been discussed in

[108]For a contrary opinion see D'Aveni and Ravenscraft (1994), who argue for positive economies of integration. However, they also note that these are "somewhat offset by increased bureaucracy costs" (p. 1192). Therefore, "the trend away from vertical integration may be the result of widespread uncertain demand conditions" (p. 1196) - a trend still observable today (Mpoyi, 2003).

the section on agency theory. Considering ex post uncertainty is not included in this discussion, as this type of uncertainty is very specific and is discussed as part of the subsequent section on management through (personal) relationships.

The first measurements are those that can be taken to give participants in the network *ex ante* more information about their partners. The two mechanisms usually mentioned in this context are *signaling* and *screening*[109]. The two concepts can be considered "the mirror image" of each other, differing only "in the assumption of which party moves first" (Sanders and Boivie, 2004, p. 169). Therefore, subsequently signaling theory is emphasized without loss of generalizability. This concept has been developed first on an individual level and has later been applied in an organizational context. In his highly influential essay on signaling effects in education, Weiss (1995) argues that increased wages due to better individual education are not directly based on increased productivity of better-educated employees. On the contrary, from this perspective, talented students that have the potential for higher productivity also incur higher opportunity costs during their time at school. They would thus have an incentive to leave school as early as possible. However, if schooling is considered as a *signal* for unobservable information to future employers, rather than as a pure means to increase productivity, prolonged schooling can be explained:

> They [talented students] would, however, stay in school longer if they cared more about the future, or enjoyed school more than the average student, or learned more rapidly. These preferences make workers desirable employees: they would be less likely to quit or be absent (...) and more likely to participate successfully in training programs. Of course, if people with desirable preferences go to school longer, firms would use education in their hiring criteria as a means of selecting workers with these desirable traits (Weiss, 1995, p. 137).

Thus, the duration of the education can be used as a signal by students (agents) to overcome uncertainty on the side of future employers (principals) about unobservable characteristics of the students. While this signaling of students is limited to an individual level, there is also considerable need for signaling effects on behalf of organizations. Especially those that produce intangible goods, which often have the property that their quality is difficult to assess[110], need to signal that their products fulfill certain requirements. In an organizational context this signaling is commonly achieved through *accreditation* or *certification*, which is the official appraisal - either through peers or

[109] This also corresponds with bonding and monitoring costs as they have been discussed as part of agency costs. The first refer to those costs that are incurred for showing that a partner is not inclined to behave opportunistically. The latter refer to those costs that are incurred for ensuring that a partner does not behave opportunistically.

[110] As has been described above, the main reason for this is that intangible goods are *experience* goods. Their quality cannot be assessed without experiencing (i.e. usually purchasing and using) it.

through a third party - that the accredited organization fulfills certain quality standards. Consequently, especially for fields such as health care or education, accreditation agencies blossom (Durand and McGuire, 2005). Since IS components are also information goods, they are in many aspects similar to education. Consequently, in the IS development network, an accreditation process is supposed to be highly suitable to reduce ex ante uncertainty (Alvaro et al., 2005; Stafford and Wallnau, 2001).

What exactly should be accredited and how is subject to considerable discussions. In the end, accreditation as it has been discussed here is a signal that is intended to testify that the quality of a product or service is meeting certain requirements. However, exactly the fact that this assessment of quality is difficult to achieve has raised the need for accreditation in the first place. Thus, accreditation is only a *substitute* for quality assessments. That this substitute is difficult to define has been well covered in the literature on accreditation of business schools. Ideally, an entire school is accredited, such as the accreditation of the Association to Advance Collegiate Schools of Business (AACSB) (Trapnell, 2007). However, this accreditation of entire schools is difficult, if not impossible. So, other, more detailed measures have to be found. Scherer et al. (2005, p. 663) for example discuss the assessment of program quality, but also argue that "program quality depends largely on good students and good faculty." In this context it seems obvious that in IS development, ex ante quality assessment if facing similar difficulties, which would make an assessment of the individual employees of an organization necessary. It has even been argued by Siskos et al. (2007) that this individual assessment is supposed to follow an approach based on multiple criteria, such as professional experience and education. However, there is also another aspect to this certification - namely that the final result of the IS development process is a piece of software. Here special metrics can be imposed to measure how well this software fits with its requirements. Thus, it can be assumed that both individuals and the software they have developed are subject to an accreditation process.

However, this accreditation process, no matter whether individuals or software is accredited, is by no means a panacea to guarantee the success of the IS development network. As Casile and Davis-Blake (2002, p. 188) found, again in the academic sector, accreditation can be a costly endeavor, and that consequently, "schools were more likely to seek accreditation if they were operating in a high-prestige, high cost market." Therefore, it can be assumed that, in the IS development context, the need for accreditation substantially reduces the number of potential partners. Again, this is a double-edged sword. On the one hand, through accreditation process, the low quality suppliers of components are excluded from the network. This is obviously in the interest of the inter-organizational network as a whole[111]. However, at the same time, it has been argued that a key driver for the IS development network is the cooperation of multiple,

[111]Especially because the whole system is only as strong as its weakest link. This is well illustrated by the above given quote of Lorenzoni and Baden-Fuller (1995, p. 154) that "it takes many partners operating effectively to make the system work, but the negative behavior of only a few can bring the whole system to a halt."

highly innovative companies. A key argument of this has been the role of entrepreneurial spirit, especially in smaller, younger companies. On the other hand it is therefore very well conceivable that especially these young, small companies that promise to be a pillar of the network, are driven out by too strict accreditation standards. Since it can be expected that the accreditation process is initiated by the hub, this is an example how this organization has to act in a twofold role. From a strategic perspective, the more partners can be included in the network, the higher to probability for innovative ideas, the higher the variety of developed solutions, and the larger the addressable market. However, from a managerial perspective, the low quality suppliers have to be excluded to prevent damage to the overall system.

Besides this narrow edge of whom to accept and whom to reject, there is also an issue with those organizations that already have been accredited. When researching the answers of organizations to pressure from a normative environment - such as a strong dependence on accreditation (Casile and Davis-Blake, 2002) - the theory of institutionalism evolved. This theory states that organizations do not really attempt to maximize profits. Rather, organizations strive for stability in a complex environment. The theory of institutionalism argues that organizations do this through following certain prescriptive behaviors when interacting with their environment. These behaviors result in organizations becoming more and more similar. Through processes of coercion, mimicry, or normalizing, diversity in organizational structure is reduced (DiMaggio and Powell, 1983). Since diversity and the therefrom resulting innovativeness are key to the success of the IS development network, this process of becoming more and more similar is harmful for the overall success of the network[112]. Therefore, organizations need to have strategic choices on how to counter this process and preserve their uniqueness (Oliver, 1991). It is therefore of prime importance that the accreditation agency indeed institute these strategic choices for partners.

Once a relationship with a partner has been entered into, there is still *ex interim* uncertainty. Thus, the need to increase information during the relationship has to be a key aspect of managing the IS development network. Jensen and Meckling (1976) mention monitoring costs as a key constituent of agency costs. In their understanding, these costs are not limited to observing or measuring the partners' behavior. Rather, they include various efforts to *control* the agent. In traditional (manufacturing) industries, the principal has the choice between engaging in a close relationship with the partner, which includes the necessity to control the partner and the resulting monitoring costs, and contracting an arm's length relationship, which does not incur these expenses (Dequiedt and Martimort, 2004). In this context Nelson et al. (1996) argue that packaged software has *physical goods* aspects that help reducing monitoring costs. However, the IS development context cannot be limited to packaged software. On the contrary, it has been argued that the often intangible knowledge required to successfully deploy the soft-

[112]That similar processes are working in the business schools has recently been raised by Mintzberg (2004).

ware is considered a key aspect of IS development. In this context, the discussion above has shown that the immaterial, intellectual properties of the technology in IS development result in enormous transaction costs, which render an arm's length relationship impossible. Therefore, monitoring the agent is the only means to ensure behavior that is in the interest of the principal.

Monitoring of partners has not been a well researched field in IS deployment. Nelson et al. (1996) mention project management and quality assurance as necessary aspects of monitoring, however, without further dwelling on the issue. Yet, especially in the literature on IS outsourcing, monitoring a relationship is somewhat better covered. As Dibbern et al. (2004, p. 8) note, "the growth of IS outsourcing has spawned an industry whose primary function is the monitoring of outsourcing contracts." In order to achieve this monitoring, several means have been established, among them benchmarking, auditing, or keeping a small group of IS professionals in the outsourcing organization, the so-called *retained organization* (Gewald and Helbig, 2006). This retained organization possesses the knowledge to assess the quality of the provided services, but not the capability to provide them itself. All these measures that are used to manage the relationship to and to align the expectations of (i.e. monitoring in the sense of Jensen and Meckling, 1976) the service provider are commonly mentioned as best practice in outsourcing relationships. In the context of an IS development network using these monitoring devices promises to be a feasible way for reducing uncertainty within a relationship. Here also the above mentioned close inter-connection between the different management mechanisms becomes obvious. Information sharing routines can very well also be subject to standardization, which has also been covered in the literature. Here, standardization "involves central repositories that provide a common knowledge base for sharing visions and contexts among the participants, such as discussion forums, frequently asked questions (FAQs) facilities, and electronic libraries with problem definitions, successful experiences and best practices" (Chi and Holsapple, 2005, p. 67). It can be rightfully assumed that the partners in an inter-organizational IS development network use these standardized information sharing systems for the reduction of ex interim uncertainty.

Summarizing the so-far discussion, information can be disseminated throughout the IS development network through various ways and means. Of special importance are both ex ante and ex interim dissemination mechanisms. The first referring to those monitoring devices that give the partners better knowledge about each other before they actually enter into a relationship. The latter referring to those mechanisms that give partners better knowledge about the relationship they are already part of. Investments into these

information sharing mechanisms by both the spokes and the hubs[113] promise to be an essential management mechanism due to uncertainty in the network. Thus the second proposition on management mechanisms is the following one:

> *Proposition Mon.* Both large IS producers (hubs) and smaller software producers (spokes) invest into monitoring routines in order to manage their relationship(s)[114].

The discussion of ex post monitoring has so far been omitted, and this with good reason. As it has been argued above and also in Section 2.1.2.4, due to its idiosyncrasies, assessing the quality of IS is very difficult. It has therefore been argued that an increase in the duration of the relationship promises to be a feasible mechanism to reduce ex post uncertainty. If the interaction is not seen as a single event, but rather as a first of reoccurring ones, ex post uncertainty can be substantially reduced. This is also well covered in the literature, where for example Williamson (1979) notes that the enhancement of a relationship's duration increases the reliance on *relational* contracts. The main idea of this type of contract is that the relationship is evolving over time, and that this history of the relationship is more important for future adjustments than the original, explicit contract (Williamson, 1979; Ring and Van de Ven, 1992). With other words, management of relationships in complex environments is best achieved through dynamic adjustment in a healthy, trusting relationship (Kelly et al., 2002; Parkhe, 1998b). This idea has already been raised in both the discussion on behavioral and complexity issues and is subsequently addressed in the discussion of management through (personal) ties, which are assumed to be key for this kind of relationship (Hamel et al., 1989).

2.3.3.3 Management through (Personal) Relationships

The final management mechanism that can be applied in the inter-organizational IS development context is that of (personal) ties between the involved parties' employees. The rationale behind this aspect is again rooted in both behavioral and complexity issues. As it has been argued, designing a relationship in such a way that it is long lasting can lead to increased efficiency in this relationship, and therefore act as a safeguard that curbs opportunistic behavior. Similarly, coordination costs can be substantially reduced through mutual adjustments through personal ties, if the task that has to be coordinated is very complex. Both aspects have been addressed in the literature on IS development, and are subsequently briefly introduced.

[113] The fact that these investments have to be conducted by both the hub and the spokes is important here. An example for this type of conjoint investment would be a certification mechanism. Obviously, making sure that a piece of software or an employee is passing the certification can considered a substantial effort by the spokes; however, at the same time preparing and actually conducting the certification is also an effort for the hub.

[114] Similar to the last proposition on standardization, this one is also deliberately left rather open-ended. I.e. it does not further specify what and how this monitoring is supposed to be achieved.

Inter-organizational networks in general are often described as being governed by incomplete contracts, which include a certain leeway, and therefore the ability to adjust the contract when environmental conditions change (e.g. Anand and Khanna, 2000). The fact that this not necessarily has to be a downside has been emphasized by Ghosh and John (2005, both p. 356), who argue that "the naive notion that contract terms should always be written as tightly as possible must be abandoned." Especially when a network is formed to realize product enhancements, adjustments over time are necessary, and "thus, contract terms should be engineered to facilitate adjustments." As the discussion on the intellectual nature of IS as an information good has shown, this is clearly the focus of IS development networks. Therefore, it can be expected that these principles have a high influence on these networks. The motivation that Elfenbein and Lerner give for their study of incomplete contracts in the setting of Internet portals closely mirrors this perception:

> The turbulence of the competitive landscape, the uncertainty of future value decisions, the perceived need for speed in decision making, and the existence of new but poorly understood measures of performance and effort correspond well with the assumptions that lead theorists to build incomplete-contracting models (Elfenbein and Lerner, 2003, p. 357).

In a similar vein, Banerjee and Duflo (2000, p. 1000) found that in IS development *offshore*[115] outsourcing relationships are based on the assumption "that the [providing] firm's current understanding of the project is correct and that the firm adheres to its own productivity norms. The firm and the client understand that both these assumptions may be false." Consequently, these relationships are based on incomplete contracts in a sense that they allow for dynamic adaptation in case that these assumptions should in fact prove to be wrong. In very a similar context, Gopal et al. (2003, both p. 1678) found empirical results that "underscore the incompleteness in the contracting environment" and state that "it is important to recognize that an incomplete contract need not be inefficient." Thus, it can be argued that relationships in the IS development context are very well described by an incomplete contract.

The second assumption that IS development or deployment projects are inherently very complex endeavors and should thus use a high degree of informal, personal coordination mechanism has also been shown in multiple research efforts. Kraut and Streeter (1995, p. 80) for example analyzed 65 development projects and found that informal, personal mechanisms are, albeit expensive, "important for successful coordination in software development." As their work also indicates, these mechanisms are frequently

[115]This term refers to the fact that IS development is relocated to a distant country like India or China. The main reason for *offshoring* are the lower labor costs in less developed countries, but also for example the access to IS resources in general, and especially to well trained personnel. See Hirschheim and Dibbern (2006) and the there quoted literature for an introduction to the topic.

used and deemed to be of high value[116] independent of project characteristics such as size, certainty, or the stage of the project life cycle they were in. The main reason for this is the fact that the "development of Information Systems (IS) is a creative effort that involves the expertise, insights, and skills of many individuals" (Tiwana and McLean, 2005, p. 14). Thus, integrating this individually held knowledge or expertise is key for a successful team performance (Okhuysen and Eisenhardt, 2002; Stein and Vandenbosch, 1996).

That this integration of individually held expertise is a process that requires a high coordination effort has been analyzed by Faraj and Sproull (2000). They argue that coordinating the expertise necessary for software development is determined by three major factors. First, team members have to recognize the need for specific expertise. Second, team members have to know who has what knowledge, and further "only in the simplest situation does knowing expertise location refer to knowing where an answer to a problem is located. In nontrivial cases, it refers to knowing the most effective expertise to call on to develop a solution." Finally, the team has to be able to successfully integrate the expertise of its members: "Team members integrate individual outputs, and problem solve through an emergent process of informal interactions and sharing of expertise" (both p. 1557). This three-staged process of expertise integration is obviously one that to a large extent has to rely on inter-personal ties, and thus is best coordinated through informal, personal mechanisms (Kraut and Streeter, 1995; Tiwana and McLean, 2005).

As this discussion shows, the management of relationships that cross organizational boundaries in a network cannot be solely based on formal control. As Parkhe (1998b, p. 222) notes, "there exists a "control gap" in managing networks, as compared to managing hierarchical organizations." The main reasons he asserts for this *control gap* are closely related to the above listed factors that influence the dependence of one organization on another: High importance of the relationship, low control over the relationship, and little transparency in the relationship (Pfeffer and Salancik, 1978). Thus, it can be argued that this control gap is very difficult, if not impossible, to close and that a certain degree of vulnerability exists in every relationship. If this vulnerability cannot be overcome, a possible solution would be to ensure that the other parties do not exploit these vulnerabilities. In this context the notion of trust plays an important role.

Trust in this context can be exactly defined as "the mutual confidence that no party to an exchange will exploit the other's vulnerability" (Sabel, 1993, p. 1133). Similarly, yet more detailed, Mayer et al. (1995, p. 712) define trust as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party." Thus, trust can be considered to be

[116] As Kraut and Streeter (1995) argue, both use and value are highly correlated. This first, as obviously those mechanisms that people find more valuable are also used more often. However, it has also been shown that people judge those mechanisms they are familiar with more favorable (Zajonc, 1968).

addressing exactly the issue of overcoming the above mentioned control gap. Trust is often considered the only feasible way, since despite all efforts to close the *control gap*, this will only be possible partially: "As a practical matter, however, in real-life alliances there will always be some uncertainty, (...) there will always be some vulnerability, (...) and there will always be less than full control" (Parkhe, 1998b, p. 222).

As the so far discussion also has shown, organizations have manifold mechanisms for addressing these issues, such as reliance on standardized processes, skills, or technologies or the implementation of far reaching monitoring structures. All these mechanisms can be considered to be contributing to some *type* of mutual trust in a relationship. In their discussion on the topic, Barney and Hansen (1994) distinguish between three types of trust. *Weak* trust emerges when partners do not consider themselves vulnerable. In highly transparent commodity markets exchange partners cannot take advantage of each other, thus trusting each other is the norm rather than the exception. The above described mechanism of standardization is contributing to this type of trust. If the components that are exchanged in the IS development industry are absolutely standardized, the participating organizations are not vulnerable. However, as the discussion on idiosyncrasies of IS development in Section 2.1.1.3 has shown, albeit striving for it, complete standardization cannot be realized in the IS development context. Rather, the focus of an IS development network are individually developed (or at least adapted) components. Thus, higher levels of trust have to be initiated. *Semi-strong* refers to "trust through governance" (Barney and Hansen, 1994, p. 177). That is, albeit certain vulnerabilities exist in a relationship, these are not exploited, since the costs that come with this exploitation are higher than the benefits. This type of trust is addressed through the above discussion on monitoring. If the exchange relations between partners in the IS development network would be highly transparent, severe penalties could be agreed upon, if partners exploit vulnerabilities of others. However, here again the idiosyncrasies of IS development render this approach difficult. It has been exactly the argument of the preceding section, that albeit striving for sophisticated monitoring structures, the nature of IS development makes this complete transparency impossible. Thus, again a higher level of trust has to be initiated. This final type of trust has been labeled as *strong* trust. If this type of trust exists between exchange partners, vulnerabilities are not exploited, "independent of whether or not elaborate social and economic governance mechanisms exist, because [this] behavior would violate values, principles, and standards of behavior that have been internalized by parties to an exchange" (Barney and Hansen, 1994, p. 179). Therefore, in the complex, dynamic and interdependent environment of IS development, strong trust promises to be the only feasible way to completely close the *control gap*, and thus it helps to address not only coordination, but also behavioral concerns. This has also been recognized by Parkhe (1998b) who proposes trust also as a mechanism for guidance of partners' behavior in these uncertain environments. The idea of trust as a prerequisite for network success has also received considerable attention in the literature. Gulati (1995, p. 105) for example argues that "trust is also an important

component of the control mechanisms used within alliances," and in studies conduced by Zaheer et al. (1998, p. 154, emphasis in original), "empirical results in fact reveal a direct link between *inter-organizational* trust and performance."

The question that remains to be answered is whether trust can be deliberately built (Parkhe, 1998b). The answer given to this question is best described with a cautious yes. On the one hand, trust has to be built over time. The reason for this lies in the fact that trust, defined as the not exploiting of vulnerability, is a *positive* experience. Albeit partners have the opportunity to take unfair advantage, they do not do so. On the other hand, destroying trust is a *negative* experience; despite not expecting one's partner to take unfair advantage he does so. As Parkhe (1998a) argues, positive experiences require constant reinforcement to take effect, while negative experiences take effect after only a single exposure. This can be summarized with Parkhe (1998a, p. 418): "Trust must be nurtured continually because, like a house of cards, trust is hard to build and easy to destroy, which strongly suggests that alliance dynamics must be managed carefully." Parkhe (1998a) argue in this context, that trust essentially emerges from three sources: Backward looking from past interactions directly with a partner or from reputation gained from past interactions with other partners; or forward looking from future expectations.

In the context of past interaction directly with the partner, it is important to note that these interactions always happen between individuals. This has already been touched upon above, and is reinforced by Parkhe (1998a, p. 420), who states that the "key requirement for such mutual comfort to arise is sustained involvement at all phases of an alliance by people." These ideas are also reflected in the concept of *relational capital*, which has been defined as "mutual trust, respect, and friendship that arises out of the close interaction at the individual level between alliance partners" (Kale et al., 2000, p. 218). Obviously, these ties are also to a large extent helpful in resolving behavioral concerns. However, they also promise to be the only viable way to coordinate the complex interactions between network partners, which is the essence of this section. In this light, the concept of relational capital is complementary to that of the relational view, or as Kale et al. (2000, p. 232) frame it, "our findings [on the concept of relational capital] are consistent with the relational view of competitive advantage offered by Dyer and Singh (1998)."

Besides these direct experiences with partners, reputational effects can contribute to the trust that an organization is enjoying. However, as Dollinger et al. (1997) also emphasize, just like trust, reputation is a multi-dimensional concept. An organization can have a reputation concerning essentially every aspect of a modern firm: "A firm might have an excellent reputation for financial stability, yet its products may be seen as non-innovative and below-average quality" (Dollinger et al., 1997, p. 128). Consequently, all the so far discussed aspects of a relationship - like innovativeness, quality, and speedy delivery - are subject to reputation effects. However, in the context of trust, the reputation for integrity and trustworthy behavior can be considered most important. As

different as these types of reputation might seem, the underlying principle how they might reduce frictions in the network is very similar, they act "as a surrogate for direct experience with a partner." With other words:

> The benefits of a positive reputation would be expected to continue beyond the completion of the transaction and enhance the chances for satisfaction throughout the life of the relationship. If this were not the case, a positive reputation would not be a desirable feature of a partner firm (both Saxton, 1997, p. 445).

Thus, Dollinger et al. (1997, p. 128) note, "a positive reputation can be shown to increase the desirability of the target firm as a strategic alliance partner." Consequently, a negative reputation can also be seen as impeding the ability to partner in inter-organizational networks. Similar to trust that is established through direct interactions, building this positive reputation is often a long-term process[117] (Weigelt and Camerer, 1988), which requires continuously consistent behavioral patterns. One change in behavior might spoil the entire reputation building exercise (Rhee and Haunschild, 2006). It can therefore be expected, that an organization that has invested into building a reputation of being a trustworthy, respectable, and friendly partner, is not likely to forsake this reputation through deliberately participating in a project without commitment. Thus, the reputation of participants in the IS development network, promises to lead to a decrease in coordination efforts between the different partners (Ring and Van de Ven, 1992).

Finally, the importance of future events has to be emphasized. Only if the relationship between partners is extended beyond the actual transaction, a relationship management that involves trust or reputation of trustworthiness can be successful (Banerjee and Duflo, 2000). If conjoint participation on a project is seen as a one-off event, there is no reason why an organization should invest into behaving as or building the reputation of being a trustworthy, respectable, and friendly partner. However, if recurrence of projects is given, or at least can be expected, relational capital that has been built over time promises to be a valuable instrument for managing the relationships with network partners. This indicates the close connection with ex post alignment of incentives and also touches upon the discussion on transaction *frequency*. Summarizing this section, it has to be stated that building a trusting relationship between the partners in an IS development network is an important management mechanism in the network. Thereby it is irrelevant whether this trusting relationship is based on past direct interactions, a positive reputation, or future expectations. However, obviously all three aspects are highly interrelated.

[117] Please recognize here the close connection to the resource-based view. *Reputation* is considered to be a resource yielding a sustained competitive advantage (Mahoney and Pandian, 1992; Dollinger et al., 1997).

Proposition Rel. Both large IS producers (hubs) and smaller software producers (spokes) invest into building trusting relationships in order to manage their relationship(s).

Again, investments of this type can be expected to be beneficial for both the hubs and the spokes. However, it has to be stated that building trusting relationships is probably the most expensive investment in the network. Therefore, it can be assumed that the highly expensive coordination mechanism of personal relationships that foster mutual trust cannot be applied to all the existing relationships with similar intensity. Only those that are perceived to be most important are enjoying this kind of special treatment. Finding out if this is really the case is exactly what has been described as 'connecting the two preceding threads of research objectives' in the introduction. Several benefits have been developed, as have been coordination mechanisms. After having found whether these are indeed the driving forces behind the IS development network, a connection between the findings of these research questions promises to reveal whether those relationships that promise to be most important are also managed in the optimal way. This has been the last theoretical proposition. The following section briefly wraps up the so far conducted theoretical preconceptions and then leads over to the following chapter, in which the methodology is explained in further detail.

2.4 Summary

In this chapter the theoretical foundations for this study have been laid. First, a thorough discussion and delimitation of what constitutes the field of IS development has been conducted. This discussion has emphasized specificities of IS as both intellectual and information goods. Based on a subsequent discussion of general systems theory, it has been argued that any complex product should be developed along the principles of modularity on both the product- and the organizational level. In this context, it has been argued that different industry structures are used to assign different tasks to various stakeholders. In this consideration, the (emerging) IS development industry mirrors the structure of a strategic hub-and-spoke network. After discussing briefly the specific structure of such a network, a discussion of literature on the topic specifically for IS development affirms the perception that this phenomenon is not well covered in this field. Consequently a broader perspective is chosen that incorporates the field of organizational science.

However, as this discussion unfolds, it becomes obvious that the idiosyncrasies of IS render such a transfer of principles from industrial technologies difficult, if not impossible. In this context, the recent emergence of Service-Oriented Architectures (SOA) is introduced, as it promises to be a thrust in the development towards such a higher degree of inter-organizational division of labor in the field of IS development. In this context it has been argued that this development can essentially be analyzed from two different perspectives, a technical one and an organizational one. As the latter is still

largely neglected in research, this perspective is chosen. From this organizational vista, research on inter-organizational networks usually poses one of two distinct questions: First, answers are given to the question of the reasons why organizations enter into such relationships. Second, answers are given to the question how such a relationship can be best managed once it is entered. As both questions are closely intertwined with each other, this study attempts to give a comprehensive answer to both.

The first perspective is filled with theories which are related to the field of strategic management. As it has been argued, strategic management literature follows one of two distinct paradigms - assigning organizational success either to the market surroundings or to resources internal to the firm. As the industry is given in this study, the latter paradigm is selected, and here especially the resource-based view. From this viewpoint the resources that are at the disposal of an organization are the determining factor for this organization's success. Which of the multiple resources at the disposal of an organization can lead to a sustained competitive advantage, and thus to organizational success are covered in the basic theory. However, the basic theme has also been varied through various enhancements. Among the concepts discussed here has been that of *dynamic capabilities*, which covers the ability of organizations to react to changed environmental conditions through adapting their resource base. Further, specificities of resources in an inter-organizational context are introduced. In a complex interconnected environment, all organizations have to rely on resources that they do not control directly. From a theoretical perspective it is argued that especially those organizations are attractive that posses resources that are complementary, supplementary, or surplus to the resources of the focal organization. In this context, it has been argued that especially those resources that give the focal organization access to new technologies, to innovations, or to new markets are attractive. For these three perspectives, propositions have been developed for answering the first research question, why organizations (both hubs and spokes) participate in such a network.

The approach to finding an answer to the second research question is subdivided into two broad research threads. The first thread is addressing *behavioral* concerns within the network. These issues stem from the co-existence of two underlying assumptions that all theories share. The first assumption is that of *bounded rationality*. Due to limited cognitive abilities, humans are not able to correctly assess their environment in its entireness. Therefore, they by necessity have to base their decisions on incomplete information. The second assumption is that of *opportunism*. Humans do not obey the rules. Rather they can be expected to use unfair means to take advantage of others. If both assumptions hold true, which is assumed here, transactions between organizations are hazardous endeavors, which have been analyzed in various theories. Most of these theories originate in the field of economics. From the multitude of theories in this field, especially those are discussed that are addressing issues at the organizational level. As the relationships between organizations are of prime interest, only those theories that analyze organizations through the relationships they engage in are considered.

The overarching of these theories can be considered that of transaction costs. The main idea of this theory is that similar to frictions in mechanical systems, transaction costs reduce the efficiency of economic systems. Based on an analysis of what causes higher or lower transaction costs, the theory addresses how organizational structures adapt to these contingencies. Usually, high transaction costs result in organizational structures that can be better controlled - usually the integration within one organization. The main aspect of transaction cost theory is assumed to be the specificity of certain investments necessary for a relationship[118]. Agency theory then especially addresses how uncertainty influences the relationship between a principal that delegates a task to an agent. Both, the effects of uncertainty before, throughout, and after the transaction, and how to mitigate them are discussed in this theory. The final theory is that of incomplete contracts and property rights. It is argued in these concepts that due to the above mentioned underlying assumptions, long-lasting relationships have to be adapted over time. As long lasting relationships are a desirable goal, these concepts emphasize the importance of ownership of assets to realize them. All three aspects consequently have to be addressed in order to minimize behavioral issues in the IS development network: Asset specificity has to be kept low, uncertainty has to be reduced, and durable relationships have to be designed.

The second research stream is addressing *coordination* issues. These arise primarily from inherent complexities of the developed system, and only secondarily from behavioral problems. These inherent complexities stem from the fact that in a conjointly developed system, components are exactly not completely independent of each other. Rather, organizations depend on the input from each other in order to successfully develop and deploy such a system. Theories on organizational interdependencies have been discussed and especially on the basis of the classification of organizational interdependencies as being either pooled, sequential, or interdependent, it has been argued that IS development is one of the most complex tasks, which consequently involves all three types of interdependencies. Thus, coordinating this endeavor requires different coordination mechanisms. First, it has been argued that standardization is one of the most fundamental mechanisms. It can be addressed for example through the above described wide-spread adoption of SOA principles. Second, monitoring through information sharing routines is considered to be of high importance for the here described IS development network. Finally, mutual adjustment through personal, informal ties has been deemed to be of even higher importance. As the proposed management mechanisms from a behavioral and a complexity perspective are very closely related to each other, this part of the theoretical discussion closes with a discussion of these mechanisms in the context of IS development. Here again, propositions have been developed how hubs and spokes should manage their relationships with other participants in the network.

[118]Transaction cost theory also addresses the other two aspect of uncertainty and frequency. However, as the other two theories are more detailed in this regard, they have also been discussed.

This has been a brief summary of the above proposed reasons, why organizations enter into such IS development networks, and how the management of such relationships is supposed to be realized. These have been derived from the various theoretical lenses that have been deemed as most appropriate for this study. Since there is no far reaching knowledge of this phenomenon in the IS development context, the propositions have deliberately not been formulated as sharp hypotheses. Rather, this theoretical discussion has been intended to explicitly express the ideas that should guide the subsequent empirical research. The chosen research methodology is that of a *case study*, which is especially suited to answer the exploratory question of *why* such an IS development network emerges, and *how* it should be managed. This methodology is introduced in more detail in the next chapter. After this discussion, the following chapter is concerned with the actual design of the empirical research.

3 Research Design

As it has been noted in the introduction, a *research design* is can be defined as a plan for answering certain research questions (Kerlinger and Lee, 2000). Thus, after having discussed the theoretical preconceptions in the preceding chapter, the goal of this chapter is to address how the propositions that have been developed on the basis of these preconceptions can be addressed in order to obtain answers to the posed research questions. Much effort has been made in order to distill generic research designs that can be applied in various contexts (e.g. Creswell, 1998; Kerlinger and Lee, 2000; McGrath, 1982; Stone, 1978). As a result of this effort, today a multitude of classifications for research designs exist - which are partly disjoint and partly overlapping. Consequently, this work does not completely and solely follow one of these taxonomies. Rather, a multi-staged approach is followed. First, different research strategies are introduced on the basis of the work of Stone (1978). This involves a discussion of dimensions that vary in different research settings. These dimensions have an implication on which strategy is more or less appropriate. The first section therefore closes with the selection of one of the proposed research strategies according to the specificities of the IS development context. In the second section of this chapter, this chosen strategy is further elaborated on in considerable detail. Various specificities are discussed in order to prepare and delimitate the approach taken in the empirical part of this study. Exactly this approach of data collection and analysis is then described in more detail in the last two section of this chapter

3.1 Research Strategies

3.1.1 Dimensions for Classifying Research Settings

In his work, Stone (1978) argues that researchers always have to make trade-offs when choosing their research strategy. No strategy exists that is superior to other strategies in all aspects (Scandura and Williams, 2000). However, only if the researcher has a clear understanding of what the involved dimensions exactly are, which degree of each of the dimensions is appropriate for his research objectives, and how well the different existing research strategies meet these requirements, he is able to deliberately select the strategy that best fits with his research objectives (McGrath, 1982). Commonly, three different dimensions[1] are given as most important for the selection of the research strategy: (1)

[1] Stone (1978) gives seven dimensions. However, the first three are more or less identical to those proposed here, and the latter four are related to at least one of these three. Therefore, the subsequent discussion implicitly includes these four missing dimensions.

the realism or naturalness of the context in which observations are made; (2) the control that a researcher has over the setting, which includes the ability to precisely measure the proposed variables; and (3) the generalizability of the research findings to other contexts (McGrath, 1982; Scandura and Williams, 2000). In order to allow for exactly such a deliberate choice of research strategy, these three proposed dimensions are subsequently discussed.

The first dimension is that of *naturalness* or *realism* of the research setting. Studies that emphasize this dimensions are placed in settings that are (at least perceived to be) real for the participants of the study. Some research objectives can only be achieved in this natural setting. Especially those issues that involve multiple, possibly even so far undiscovered, often highly interrelated aspects are ideally analyzed in the setting in which they naturally occur. Following Stone (1978) the main reason for this is the fact that both the strength and the range of the studied variables are generally greater in their natural settings. An example for this would be stress levels. In a natural setting, the level of stress can be expected to be much higher than in any artificial setting that the researcher constructs. Also, contamination by some *artifacts*, such as demand characteristics - the fact that research subjects behave in a way that they believe the researcher expects them to behave - can be minimized through the naturalness or realism of the research setting (Stone, 1978). Thus, before conducting research, a clear understanding of what degree of naturalness is expected to be beneficial. Once this has be achieved, a research strategy can be chosen in order to attain (at least a relatively close match with) this desired degree of naturalness.

The second dimension is that of *control* over the research setting. If the research attempts to answer questions about the causal relationships between clearly defined variables, some of these (the independent variables) have to be manipulated, and all variables have to be precisely measured in order to allow for any drawing of conclusions (Stone, 1978). In other studies this control is much less distinct, such as when certain measures are taken to manipulate a variable but this variable is also subject to uncontrollable noise. In yet other studies the research does not have any control over the variables, he can only observe them. This degree of control that a researcher has over his subjects is also reflected in the notion of *experimental*, *quasi-experimental*, and *non-experimental* research. In experimental approaches, the researcher has full control over his research subjects, over the point in time when he is doing his research and over what kind of treatment the subjects receive. In quasi-experimental research, the researcher has no control over the treatment of the subjects. In non-experimental research, the researcher has no direct control at all (Kerlinger and Lee, 2000; Stone, 1978). Again, understanding what degree of control is necessary and achievable helps a researcher to choose the right strategy.

Finally, the degree of *generalizability* of the findings is one of the three dimensions. Although generalizability should be the aim of all research, some research efforts are addressing this dimension more than others. Especially basic research is more concerned with the fundamental understanding of a certain phenomenon. Generalizability to other

contexts is often not the foremost consideration. Applied research in contrast is explicitly addressing the applicability of its results to other contexts (Kerlinger and Lee, 2000). Here again, the researcher needs a clear conception of what degree of generalizability is most desirable for his research effort.

Selecting which degree of each of these three dimensions is most desirable for a certain research effort is by no means an easy task. These three dimensions are mutually exclusive in a sense that no research strategy can be found that is superior to other strategies on all three dimensions. This fact has been illustratively described by McGrath as a *three-horned dilemma*:

> The very strengths of each strategy, plan, or method with respect to one desideratum is often its main weakness with respect to another desideratum. To maximize on one desideratum (boldly grabbing that horn) is to have relatively unfavorable levels of the other two (that is, to get part way impaled on both of the two other horns). Conversely, to optimize between two desiderata (snugly fitting between those two horns) is to guarantee a minimum on the third desideratum (that is, to get impaled, to the hilt, on the third horn). *There is no way - in principle - to maximize all three (conflicting[), sic!] desiderata of the research strategy domain* (McGrath, 1982, p. 76, emphasis in original).

Thus, the researcher can choose between several inherently flawed research strategies. The choice he has to make is which of the flaws is the least severe for a certain research effort. The following section discusses a taxonomy of research strategies with special consideration of weaknesses relating to the above discussed dimensions. Then, the last section illuminates which strategy should be followed and why this strategy is appropriate in the here addressed context.

3.1.2 A Taxonomy of Research Strategies

As it has already been discussed, there exists a multitude of research strategy taxonomies (e.g. Creswell, 1998; Kerlinger and Lee, 2000; McGrath, 1982; Stone, 1978). As most of these are at least in part congruent, subsequently the taxonomy of Stone (1978) is discussed without loss of generalizability. Stone (1978) includes in his discussion of the research strategies a three-legged approach. First, he introduces an example which uses the research strategy. This part of his work is neglected in this paper, due to the age of Stone's (1978) work, and due to the fact that it is a work with a different focus than this one, which renders the examples rather inappropriate for the current context. Second, he discusses major characteristics of the strategy; and finally, he lists a representative number of advantages and disadvantages of each strategy. The following part of this section summarizes the latter two parts of Stone's (1978) work.

The first research strategy that is introduced is the *laboratory experiment*. This strategy is characterized by the fact that it is conducted in a way in which the researcher creates a setting which he or she believes is appropriate for testing his hypotheses. In this setting, the researcher has virtually complete control over the research subjects, including assigned tasks, treatment, and control conditions. This also gives the researcher complete control over the independent variables, and therefore the ability to manipulate these independent variables at his will. Among the key advantages of this setting is the high level of control. This allows the researcher to minimize the influence of external variables, and therefore makes measurements more precise than in any other research approach. Another advantage is the possible use of control groups. This gives the researcher a clear comparison between a group that actually tests the hypothesis, and another group that only believes to test the hypothesis. It therefore again makes measurements more stable and reliable. There are obviously several disadvantages for this approach, foremost the fact that natural phenomena often cannot be duplicated in a laboratory, natural disasters and the behaviors associated with them spring to mind. Furthermore, laboratory experiments might lack realism, and might therefore generate results that are not per se applicable in reality. Finally, ethical or moral concerns have to be addressed that might result from manipulating critical independent variables such as race or social standing.

The second research strategy is that of a *simulation*. Closely related to the laboratory experiment, the simulation also takes place in a setting that is largely controlled by the researcher. However, instead of exposing participants to a predefined set of rules and regulations that govern the laboratory experiment, in a simulation, the participants are exposed to (simulated) real life situations, in which they are free to behave as they deem appropriate; obviously within the given regulations of the simulation. Within these real life situations several independent variables can be modified to a certain extend, and the behavior of the participants shows the resulting dependent variable. The two most prominent advantages of this kind of research are the relatively high (in comparison with the laboratory experiment) realism, which goes hand in hand with a higher participant involvement and lower participant demands, and the (in comparison with other research strategies like the field study) higher control over he independent variables, and the resulting high stability and reliability of measurements. Among the disadvantages of this approach are the downsides of the higher participant involvement, which might result in psychological harm of the participants, the fact that independent variables are harder to identify, and under less control than in the laboratory experiment, and finally, the obvious high costs.

The next research approach is the *field experiment*. Again, this approach closely resembles the previous one. However, this time the experiment is conducted in a natural setting rather than an artificially created environment. Independent variables are manipulated to an extent that is permitted by the situation, and the systematic observation of the experiment's participants yields information on the dependent variable. The required control over nuisance variables is achieved trough the use of control group research, or

less effective through statistical calculations. Advantages of this design are obviously the improved realism in comparison to the two so far introduced designs, and the therefore improved external validity. Furthermore, field experiments allow not only the testing of theories, but also the solution of applied problems; finally, and perhaps most important, field experiments allow longitudinal studies, that would not be feasible in an artificial environment. As disadvantages, the reduced control over, and the reduced precision in measuring, the independent variables have to be mentioned. Furthermore, experience has shown that willingness to participate in field experiments is rather low, and the intentional manipulation of one variable often results in the unintentional manipulation of others, often with unforeseeable effects.

The fourth research setting that is discussed is the *field study*. This research approach is the first non-experimental discussed here. The characteristic point for a non-experimental research is the fact that the researcher has no control over, no possibility to manipulate, the independent variables. However, the researcher systematically measures variables in the natural setting he or she decided to study, and draws conclusions from examining this gathered data. The manipulation of the independent variable is replaced by self reports of participants, or some other way to measure the extent to which participants have been exposed to the phenomenon in question. The same approach is used to measure the dependent variable. Advantages of this approach are the even increased realism in comparison to the prior introduced designs, the very low interaction between researcher and research subjects, and the fact that complex phenomena can be studied. Furthermore, this design is often used to research practical issues. Disadvantages are the high influence of variables that have not been taking into account in the hypothesis development. Field studies might yield results that are purely random, i.e. a strong relationship might be found between independent and dependent variable, although none exists in reality. Controlling for these influences is almost impossible, since manipulating independent variables is impossible.

The fifth research strategy is the *sample survey*. In this approach, data is collected from a sample of a known population. This is done using systematic techniques, e.g. interviews or questionnaires. No independent variable is manipulated. Instead the measurement of the independent as well as the dependent variable is directly taken from the answers of the survey participants. The research subjects provide data in a natural setting, is can be assumed that the influence the researcher is taking on research subjects is minimal. Finally, nuisance variables are removed through statistical calculations. Advantages of this approach are, among others, the fact that statistical methods allow a sampling process that is free of biases, and that allows a generalization from the sample to the ex ante known population. Furthermore, data is collected directly from the participants, and in a natural setting. This collected data often yields material for formulating new hypotheses; and finally the approach is relatively inexpensive. Disadvantages are the fact that standardized approaches often make participants agree to statements, which they not fully support. The willingness to answer to surveys has decreased, which might require the sending out of large numbers of questionnaires to obtain a reasonable

number of returned questionnaires. Finally, this research strategy allows only snapshot research. Developments in participants' responses cannot be grasped with the required precision.

The final research design is that of a *case study*. In this approach the researcher intensely examines a single unit of interest, e.g. a person, a department, an organization. Data is collected by multiple means, such as (published) secondary material, interviews, personal observations, and so on. The independent variable is not manipulated. The researcher solely relies on the collected data. The phenomenon of interest is studied in a purely natural setting. Advantages for this approach are obviously the flexibility of data collection, the fact that complex situations can be examined inclusively, the appropriateness of a case study to generate new hypotheses, the natural setting, and the relatively low costs involved. Disadvantages are that it is the least systematic approach, that case studies are exposed huge biases, that generalization from a case study is usually difficult, and finally that case studies are usually more time-consuming than other approaches.

3.1.3 Selection of the Research Strategy

The above conducted discussion on six generic research strategies has shown the *three-horned dilemma* that McGrath (1982) found for such taxonomies very well. None of the research approaches promises to be superior to all the others. Rather, each approach has distinct advantages and consequently also disadvantages in comparison to the others. So, as it has been discussed above, a clear understanding of which of the dimensions of research strategies are more important than the others is needed in order to deliberately select the most appropriate research strategy for a given context. With regard to the context of networked IS development that has been discussed in considerable detail above, in the following conclusions about the three dimensions can be drawn.

First, it can be safely assumed that the control over the setting and thus the ability to manipulate and precisely measure the proposed variables is absolutely minimal. Obviously, choosing on whether to join a certain organizational network or not is a highly important decision for any organization, hubs and spokes alike. Thus attempting to deliberately manipulating this decision in a real-world context is a foredoomed endeavor. The same is true for the active management of such an inter-organizational relationship. Again, the financial prosperity of entire companies[2] is in part dependent on the successful management of these relationships. Thus, it can be expected that any attempt to force companies to deliberately use management techniques which promise to be unsuccessful is not taken well by these organizations. Furthermore, both the decision to join or not and the management of the relationship once a network has been joined can be expected to be influenced by a myriad of different factors. Thus, attempting to replicate this setting in an artificial environment is also not promising to yield any meaningful

[2] Which includes adverse effects for the companies' employees. See Stone (1978) and Kerlinger and Lee (2000) for a discussion on ethical issues in research.

results. The naturalness of the context in which observations are made is thus of prime importance. Finally, the generalizability of the findings to other contexts is desired, yet not the most prominent goal of this study.

Consequently, the most promising research strategy in this context can be expected to be the one that is boldly grabbing the horn of realism, while getting part way impaled on the horns of control and generalizability. The research strategy that seems to best fit this description is that of a case study. The above mentioned advantages of this research strategy fit very well to what is required for the actual context of IS development, above all the naturalness of the setting and the realization that control over the research setting is by definition minimal. The aspect of reduced generalizability can be addressed through conducting a multiple case study (Yin, 2003; Stake, 2006). This, and further specificities of case study research[3] are discussed in the following section in more detail.

3.2 Specificities of Case Study Strategy

Applying the research strategy of case studies is commonly done in IS research. Building on a rich tradition of analyzing research strategies in the IS field, Vessey et al. (2002) examine the research strategy of a total of 488 articles that have been published between 1995 and 1999 in the five leading IS journals. They found that more than 40 percent[4] have been using either the field or the case study approach. Consequently, IS research has a long tradition of applying the case study strategy (e.g. Benbasat et al., 1987; Cavaye, 1996; Lee, 1989, and the there quoted literature) and a rich body of literature on the topic has evolved in both IS and organizational science. This rich body of literature is subsequently discussed in order to gain a deeper understanding of the specificities of the here applied research strategy. This discussion highlights four different aspects of research in general, which are discussed specifically with regard to case study research. First, a brief discussion of the fact that multiple cases can enhance the generalizability of the study is conducted. This discussion also includes how the studied cases are supposed to be selected. Second, the fact that case studies can either be exploratory or confirmatory in nature is of importance for this type of research. Differences between these two types are discussed and it is argued that the here conducted study is inherently exploratory. Third, case studies can either follow a qualitative or a quantitative research approach. Again, the differences between these two types of research approaches are discussed. As it is argued that the here proposed study is more quali-

[3] Often case studies are subsumed as part of field studies (e.g. Kerlinger and Lee, 2000). Wherever this is the case, backgrounds on field studies are also consulted for a deeper understanding of the research design.

[4] This number is very close to what Scandura and Williams (2000) report for the discipline of management science. Out of 363 articles published in the period from 1985 - 1987, 38.00 percent have been reported to be field studies; out of the 411 articles published from 1995 - 1997 the reported number is 40.90 percent. Also the relative share of case studies is consistent across different cultural settings, e.g. the US and Germany (Wilde and Hess, 2007).

tative than quantitative in nature, ramifications of this fact are also discussed. Finally, the differences between variance- and process-theoretical approaches are discussed. In this dimensions, the study so far followed a variance theoretical approach. Why this is the fact and what this means for the present work is highlighted in the final part of this section[5].

3.2.1 Case Study Design and Replication Logic

Before discussing what the necessary steps of designing the actual research are, first a clear understanding of what exactly is the unit of analysis of this study, is required (Markus and Robey, 1988). As Yin (2003) notes, the unit of analysis is implicitly defined through the research questions that a study is attempting to answer. The research questions that have been proposed in the introduction as guiding this research are addressing the organizations that constitute the industry. Thus, these organizations are also the most appropriate level of analysis. This has already been sketched in the introduction; it has already been used in the discussion on different change perspectives in Section 2.1.3; and it has also implicitly[6] guided the discussion of the theoretical underpinnings for this work in the preceding chapter. However, this decision is clearly spelled out here, as the following discussion of the study design requires a clear and explicit understanding of the addressed level of analysis.

Thus, conducting the case study research requires the selection of one or more organization(s) to be studied. However, as it has been touched upon above, contrary to the perception of Stone (1978) case studies do not necessarily have to be confined to one single unit of analysis. Rather, Yin (2003) mentions two dimensions through which case study designs can vary. The first dimension is that of how many cases actually are analyzed as part of the research. Very broadly, Yin (2003) differentiates on this dimension between single- and multiple-case designs. The in-depth analysis of only a single case, in the sense of Stone (1978), is most appropriate in a couple of settings. Either, the case might be *critical* in that it fulfills all requirements of a setting for testing a certain theory; or the case might be *extreme* or *unique* in that it is so rare that each single case is worth being analyzed; it is also conceivable that the case is *typical* for a certain group of cases; or the case is *revelatory* in a sense that it has not been accessible for analysis before; finally, the case might be a *longitudinal* case, which is followed over an extended period of time. If none of these, or comparable, arguments is working in favor of a single case study, the researcher is well advised to augment his research to include

[5] It should be highlighted here that the choices in these different aspects of a research strategy are not independent of each other. Rather, choices in one dimension have implication for the other dimensions as well.

[6] This is most obvious in Section 2.3.1.2, where especially those theories of the firm have been selected that address issues at an organizational level.

multiple cases. This especially as conducting multiple cases allows for a higher degree of generalizability (one of the key disadvantages of single case studies mentioned above) through cross-case analyses (Eisenhardt, 1989b).

On the second dimension, Yin (2003) argues for a differentiation between holistic and embedded case studies. The first refers to a situation in which each case consists of exactly one unit of analysis. In the latter, each case consists of multiple units of analysis. The choice of whether to conduct a holistic or an embedded case study is more linked to the research objectives than that of conducting a single or multiple case studies. If the research focus is on the actual case level or if there are no possible meaningful sub-units to analyze, a holistic approach promises to be more favorable. In contrast if an analysis of sub-units is meaningfully possible, an embedded case design might be more appropriate because comparing the units of analysis is easier if they originate in the same context. However, as Yin (2003) notes, an embedded case design always requires the returning to the overall case level. If no conclusions are drawn on this level, the case actually becomes a multi-case, holistic study in which the original case becomes part of the context. As this involves a change in the level of analysis, drawing conclusions from such a case becomes highly complex. The resulting two-by-two matrix is illustrated in Figure 3.1.

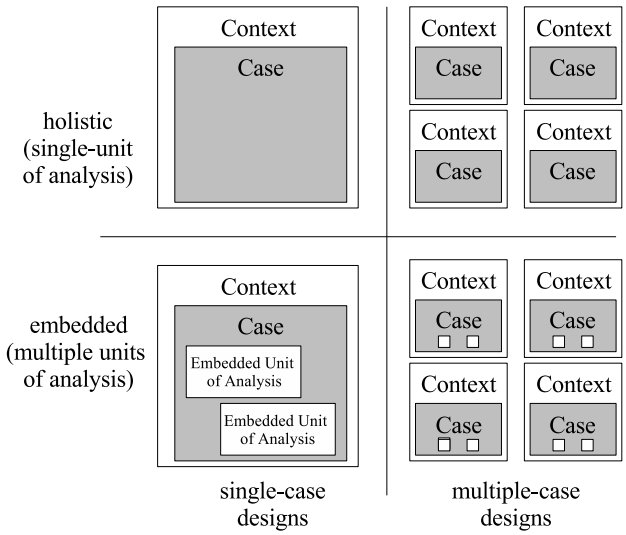

Figure 3.1: Basic Types of Designs for Case Studies.
Source: Based on Yin (2003, p. 40).

As none of the organizations that develop complex IS promises to fulfill any one of the requirements that have been proposed for conducting a single case research, the here sketched research approach should be one involving multiple cases. Furthermore, the discussed theoretical underpinnings have been largely limited to the organizational level (as this has been selected as the level of analysis). Consequently, the focus should

also be on holistic cases in which each organization is treated as one case[7]. The here proposed case study design is therefore a *holistic, multiple case design*. The question that remains to be answered is how these multiple cases should be selected.

This selection usually follows a specific logic, which is subsequently discussed. As Yin (2003) notes, this is a *replication*, rather than a *sampling* logic. The goal of the latter type of studies is the development of statements about a population of entities that is studied. In order to obtain these statements a statistical method is employed to generate a certain subset of respondents, with each data point reflecting one of these respondents. The statistical methods are used again in order to draw conclusions from the available data points to the entire population. Thus, a certain variance in the answers is required in order to generate valid statements about the relationships between proposed variables. Since for case studies the number of data points is limited and the number of covered variables is extraordinarily high, such inferential statistics is impossible, and consequently, "any application of this sampling logic to case studies would be misplaced" (Yin, 2003, p. 48). Rather, and in contrast to this logic, case studies should not be seen as data points out of a larger population. Each case should be considered as a study in its own right. Similar to ensuring a higher validity of a single study that yielded interesting results through replicating it, case studies should also be replicated.

Yin (2003) proposes two different rationales for this replication. First, a *literal* replication predicts the same or at least highly similar results. Second, a *theoretical* replication predicts different results; however, these results have to differ in a clearly prescribed and theoretically explainable way. In this context it has to be noted that predicting *different* results does not necessarily means that the final outcome has to be different. Rather, the final result might be the same, yet for very different reasons. Yin (2003) for example mentions the work of Szanton (1981), who studies different cases of eight university and five nonunversity groups that all failed in advising city officials. Despite the fact that the final result has been the same for all groups, "within each of the (...) groups of case studies, Szanton has illustrated the principle of *literal* replication. Across the (...) groups, he has illustrated *theoretical* replication. This potent case study design can and should be applied to many other topics" (Yin, 2003, p. 49). Thus, the overall selection of cases should follow a combination of the two underlying logics, as is has also been very well described by Yin as a general recommendation for multiple case study research:

> The ability to conduct 6 to 10 case studies, arranged effectively within a multiple-case design, is analogous to the ability to conduct 6 to 10 experiments on related topics; a few cases (2 or 3) would be literal replications,

[7] An embedded design, in which each relationship that an organization has with other organizations is treated as an embedded unit of analysis, is also conceivable. However, as the organizational has been chosen as the level of analysis, the holistic approach is more promising in this context.

> whereas a few other cases (4 to 6) might be designed to pursue two different patterns of theoretical replications. If all the cases turn out as predicted, these 6 to 10 cases, in the aggregate, would have provided compelling support for the initial set of propositions (Yin, 2003, p. 47).

In this context, Yin (2003, p. 47) also notes that, "every case should serve a specific purpose within the overall scope of inquiry." Thus, as it has been mentioned in the introduction, this study first addresses a hub organization. This selection has been made, because this type of organization is assumed to play a pivotal role in forming the entire network. Then, in order to increase the generalizability of the findings of this study, a second hub organization is studied. This case is indeed selected so that it promises to have similar results to the first one (*literal replication*). Once these findings have been satisfactorily validated, the second step is to deliberately select cases that promise to have divergent results - yet this for a very well founded reason (*theoretical replication*). In the context of this study these are obviously the spoke companies in the IS development network. As these are by definition more numerous, another eight of these cases are analyzed. Thus, hub and spoke cases can be considered *literal* replications among each other and *theoretical* replications with regard to the other group. This is also illustrated in Figure 3.2.

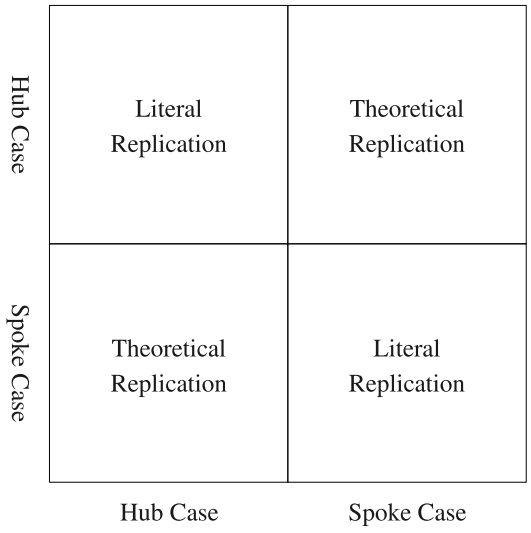

Figure 3.2: The Replication Logic among and in-between Hub and Spoke Cases. Source: Own Illustration.

The question that remains to be answered is how the researcher determines whether the cases turn out as predicted or not. Essentially this involves two distinct questions. The first is that of what exactly the goal of each case is, the second is when this goal has been reached. The determination of the goal of a case is largely based on the

differentiation between *exploratory* and *confirmatory* case design. The answer to the question of when a goal has been reached depends on the type of data collection, which can be classified as being either *qualitative* or *quantitative*. Both aspects are discussed subsequently.

3.2.2 Exploratory vs. Confirmatory Design

The insight that case (or field) studies can be either exploratory or confirmatory in nature has been raised early on by Katz (1953). The key differentiating factor between the two types of studies is that the first attempts to seek *what is* rather than to sharply predict relations: "From its [an exploratory study] findings may come knowledge about important relationships between variables, but the more definite proof of these relationships comes from" confirmatory studies (Katz, 1953, p. 74). Going more into details, Kerlinger and Lee (2000, p. 586) argue that "exploratory studies have three purposes: to discover significant variables (...), to discover relations among variables, and to lay the groundwork for later, more systematic and rigorous testing of hypotheses." Consequently, exploratory studies commonly precede confirmatory ones (Katz, 1953), especially if the subject to be studied is not yet well understood.

As has become clear during the discussion of theoretical preconceptions, the topic addressed in this research effort is not very well covered in the literature. Although intense reference has been made to the fields of general management and organizational science, the topic has not been addressed under special consideration of the idiosyncrasies of IS development. Consequently, an exploratory research design, in contrast to a hypothesis-testing one, is selected (Katz, 1953). This well mirrors the goals of the present study as they have been described above. First, significant aspects that drive the IS developing organizations to establish networks around the systems of large vendors have to be found. Three of these aspects already have been discovered as part of the preliminary theoretical work. However, if these are indeed the dominant factors remains to be determined. There very well might be other aspects specifically form an IS development context that have not been discussed in the existing body of literature. Exactly to find out whether these factors exist and what they are has to be an explicit goal of this study. Also, management mechanisms have been identified from the above mentioned reference disciplines (Keen, 1980) in order to counter behavioral and complexity concerns. Whether these are indeed also relevant for the IS development industry and if there might be others is also key for this study. Finally, how these found factors relate to each other is an important issue. Is it indeed true that - similar to other industries - partners can be managed differently according to what they contribute to the entire network? Or is it rather the fact that it is impossible to make a differentiation between the different partners in an IS development context? As it has already been touched upon at various instances, answering this question also promises to clarify the issue whether there indeed exists something like *meta-capabilities* or not (see Section 2.2.1.2).

However, as it has become obvious through the last chapter, this study does not start without preconceptions. As the research focus is on explaining why organizations in the IS development industry behave the way they do, it is actually very prone to loose focus as the amount of data that is collected through an exploratory study becomes overwhelming. As Eisenhardt (1989b, p. 536) frames it, "without a research focus, it is easy to become overwhelmed by the volume of data." Yin (2003, p. 23) also recognizes this fact when stating that at least some "degree of rationale and direction should underlie even an exploratory case study." So, throughout the preceding chapter an attempt has been made to structure the issues that organizations in the IS development context are facing. During this structuring, several propositions[8] have been framed that are assumed to be of prime importance for the above discussed research questions (Miles and Huberman, 1994). The exploratory study is now intended to shed more light on these research threads, to identify potential other aspects that might furthermore be of importance, as well as to discover the inherent dynamics of how these aspects interconnect with each other[9]. This is well reflected in the literature on exploratory studies, for which Katz (1953, p. 77) for example also recognizes the fact that "researchers do have hypotheses in mind, but these are not precisely formulated."

However, this research approach requires a very cautious proceeding, as it is an inherent characteristic of case study research that the researcher gets influenced by his studies. This fact has been noticed as problematic for a long time. Stone for example argues that

> to the extent that a research strategy requires the investigator to maintain prolonged contact with a studied system, his or her objectivity in studying the system may suffer. Some research strategies (e.g., the case study and the field experiment) would appear to be more subject to this problem than other strategies (e.g., the laboratory experiment or the sample survey) (Stone, 1978, p. 114).

However, recently the perception of this issue as being problematic has decreased. In part the problem of reduced objectivity accepted as a downside of the opportunity for increased flexibility. Yin (2003, p. 50) for example argues that a (multiple) case

[8] These reflect what is called *themes* in qualitative research. Please also see the following section.

[9] This process is closely intertwined with the analysis of qualitative data as it is described below. In this context, Patton (2002, p. 453, emphasis in original) argues that qualitative data analysis can be either conducted inductive or deductive: "*Inductive analysis* involves *discovering* patterns, themes, and categories in one's data. Findings emerge out of the data, through the analyst's interactions with the data, in contrast to *deductive analysis* where the data are analyzed according to an existing framework." The here applied approach does not neatly fit into the categories of either inductive or deductive research. It rather uses aspects of both, thus following Strauss and Corbin (1998, p. 22) and their description of *grounded theory*: "At the heart of theorizing lies the interplay of making inductions (deriving concepts, their properties, and dimensions from the data) and deduction (hypothesizing about the relationship between concepts."

study is in principle a *cyclic* endeavor: "The loop represents the situation in which important discovery occurs during the conduct of one of the individual case studies [and] in which the discovery led to reconsidering one or more of the study's original theoretical propositions." Key to this approach, however, is the awareness of potentially unjustly selected theories on the one hand and of overlooked theories on the other. Both have to be considered during the data gathering, in order to let the so-far developed theoretical preconceptions guide, and not determine, the data gathering process: "Although early identification of the research question and possible constructs is helpful, it is equally important to recognize that both are tentative in this type of research" (Eisenhardt, 1989b, p. 536). So, after it has been clarified what goals this research effort has, the next section addresses the question how these goals can be reached.

3.2.3 Qualitative vs. Quantitative Design

In the context of empirical studies, answers to research questions can be given either on the basis of quantitative or qualitative data. In a nutshell, Kerlinger and Lee (2000, p. 588) define the difference in the fact that "qualitative research is different since it does not rely on the use of numbers or measurements." However, acknowledging the fact that numerical measurements are more transparent, often real world settings cannot be completely and meaningfully described by numbers (Kerlinger and Lee, 2000). Thus, while a quantitative study relies on some kind of operationalized measures of real world phenomena, the goal of qualitative studies is "to obtain a rich set of data surrounding the specific research issue, as well as capturing the contextual complexity" (Benbasat et al., 1987, p. 374).

The given motivation for conducting qualitative studies already hints upon the close connection with the other here discussed dimensions of research approaches. Creswell (1998) mentions a number of reasons, why a qualitative approach should be selected. Among others, he lists the following reasons: First, these studies are especially well suited for answering research questions the start with *why*. Second, especially exploratory studies in which new theories are developed are often qualitative studies, as the rich data obtained in these studies is particularly suitable for theory development. Third, a qualitative approach is especially well applicable in those research efforts that necessitate the studying of research subjects in their natural setting. Obviously, this description closely mirrors what has been so far discussed as essential for this study. However, as Creswell (1998, p. 18, emphasis in original) also notes, a prerequisite for conducting qualitative studies are "*sufficient time and resources* to spend on extensive data collection in the field and detailed data analysis of "text" information."

Similar to the uncountable number of classifications of research strategies, there also exists a myriad of classifications of sources of these qualitative data. Stone (1978, p. 61) argues that "among the various methods that might be used to collect data in organizations are observations of behavior, interviews, (...) projective measures, sociometry, Q-sorting, and a variety of unobtrusive measures." Yin (2003) argues for six sources

of data in case study research, *documentation*, *archival records*, *interviews*, *direct observations*, *participant observations*, and *physical artifacts*. However, the distinguishing line between for example *documentation* and *archival records* does not seem to be that distinct in organizational science. Therefore, this study uses the - albeit much coarser - classification of Creswell (1998). He argues for four different sources of qualitative data: *observation*, *interviews*, *documents*, and *audio-visual materials*. Out of these four different means for obtaining qualitative data, the primary focus of this study is interviewing, the secondary are documents obtained from the interviewees or from public sources. This approach to obtaining qualitative data has been widely accepted, and recently interviewing has also been described as being one of the most effective ways to obtain information especially in the context of inter-organizational networks (Back et al., 2007). Despite this acceptance of interviews as data sources, the importance of the obtained documents for data *triangulation*[10] should be emphasized here.

Having determined interviews as the primary way to obtain qualitative data, a closer consideration of how these interviews should be structured and how the interviewees are supposed to be selected is appropriate. Concerning the first question, Stone (1978) argues that interviews can be either structured, that is following along a clearly defined set of questions and/or answers, or unstructured, that is exactly not following predescribed categories for answers and/or questions. From these dimensions a two-by-two matrix can be derived that is illustrated in Figure 3.3

In this context, the here used interview strategy is a typical *semi-structured interview I*[11]. This type of interview "allows the respondent to answer a predetermined set of questions in any manner he or she chooses" (Stone, 1978, p. 68). This approach accommodates very well for the exploratory nature of this study. As it has been mentioned above, some structure has to be followed in order to not loose focus. However, this has to be done in a way to allow research subjects to raise novel, so far unnoticed themes. This semi-structured approach promises to be ideal for this endeavor[12]. This strategy has been described by Yin (2003, p. 90) as "*focused interview*, in which a respondent is

[10] The term triangulation stems from land surveying, in which multiple landmarks are used for a precise determination of one's position. The concept has recently received more attention as it is also the basis of positioning systems such as GPS. In the context of data triangulation it refers to the fact that data should be obtained from various sources in order to increase the validity of the data (e.g. Patton, 2002; Yin, 2003). It has also been used for applying various methods in order to gain more validity for the studies' findings. In this context see also the discussion on the *three-horned dilemma* above.

[11] Please note that even Stone (1978) argues that there are, to his knowledge, no uses of the other, *semi-structured interview II* strategy.

[12] Especially the exploratory nature of the study justifies this selection. As qualitative studies are most suitable for complex situations, which require a flexible (re-)structuring of the research plan, this approach seems most promising. In this context qualitative research relies on "direct observation and semi-structured interviewing in real-world settings" (Kerlinger and Lee, 2000, p. 589). However, this approach should be used carefully, as Mintzberg (1973, p. 222) argues that although "it would appear that the simplest way to find out what managers do is to ask them," these managers are indeed "poor estimators of their own activities."

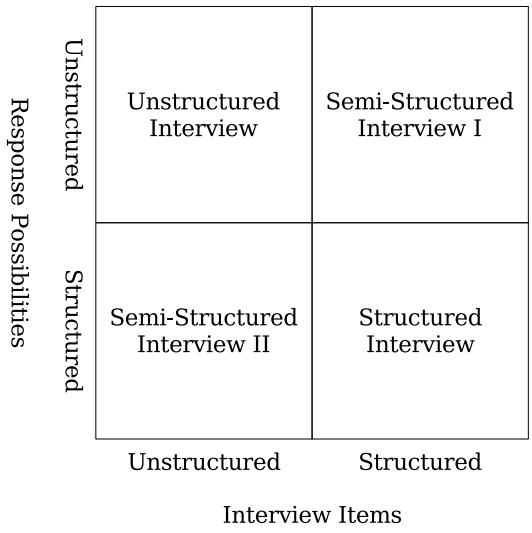

Figure 3.3: A Typology of Interview Strategies.
Source: Based on Stone (1978, p. 67).

interviewed for a short period of time - an hour for example. In such cases, the interviews may still remain open-ended (...), but you are more likely to be following a certain set of questions." Concerning the second question on how to select the interviewees, it has to be noted that the goal of the interviews is to achieve an as broad as possible coverage of the individual cases. Thus, an attempt has been made to gain different viewpoints from individuals with various roles in the different organizations. Which individuals these have been, is reported in more detail in the next section.

Before covering how these theoretical assumptions have influenced the actual research design of this study, finally it has to be discussed how the data is analyzed once it has been collected. Obviously, the interviewing approach leads to an enormous complexity in the collected data, which seems to be inevitable for studying contemporary phenomena in real life settings (Patton, 2002). Mintzberg comments on the tendency to avoid this inherent complexity and rather focus on quantitative studies - and consequently on the excessive operationalization of variables - in organizational science as follows:

> As soon as the researcher insists on forcing the organization into abstract categories - into his terms instead of its own - he is reduced to using perceptual measures, which often distort the reality. The researcher intent on generating a direct measure of amount of control or of complexity of environment can only ask people what they believe, on seven-point scales and the like. He gets answers, all right, ready for the computer; what he does not get is an idea of what he has measured. (...) The result is sterile description,

> of organizations as categories of abstract variables instead of flesh-and-blood processes. And theory building becomes impossible (Mintzberg, 1979a, p. 586).

Pettigrew (1992, p. 5) carries this perception further, when he states that "much of strategic management writing, like a good deal of the social sciences, is an exercise in comparative statistics." However, this cannot be the goal of organizational research. This goal rather has to be seen in explaining real world phenomena. As Mintzberg (1979a, p. 587) put it: "We uncover all kinds of relationships in our "hard" data, but it is only through the use of this "soft" data that we are able to "explain" them, and explanation is, of course, the purpose of research." Thus, the here proposed qualitative research approach has to deviate from the techniques used for analyzing quantitative data (Langley, 1999). Contrary to the clearly defined statistical methods used in this context, "no precise or agreed-on terms describe varieties and processes of qualitative analysis" (Patton, 2002, p. 453). However, it is recognized that at least a brief description of the data collection and analysis procedures are helping to make the study more transparent. These procedures are therefore described in the last two sections of this chapter.

3.2.4 Process vs. Variance Theory

The distinction between process and variance theory is a very common, however not yet clearly understood, one in organizational studies. Van de Ven (1992) for example argues that multiple meanings can be assigned to the label *process*. First, causal relationships can be considered as processes. In this context, a process explains why certain independent variables influence other, dependent variables. Second, process can be used to denote a category of individual or organizational actions. Work flows or decision making prcesses can be subsumed under this category. The third and final meaning of a process is that of a sequence of events or activities. Commonly, studies of this type take a historic perspective in order to explain how things change(d) over time. Especially the first and the last type of process are considered of prime relevance in the context of this study. These two are also addressed in one of the most fundamental works on this topic, the book written by Mohr (1982). He labels the first type of process as *variance theoretical*, the latter as *process theoretical* approach. Elaborating further on this distinction, he develops four basic characteristics in which the two approaches differ. These four characteristics are listed in Table 3.1 and subsequently discussed.

The first characteristic can be considered the prime differentiator between the two types of theory. The fact that in a variance theory the precursor is necessary and sufficient leads to the possible extension that more of the precursor leads to more of the outcome. Obviously such an extension generates the two important aspects of prediction and control of the outcome, which "are powerful benefits, and the potential for attaining them helps to explain why variance theories are so commonly pursued" (Mohr, 1982, p. 38). In contrast, process theories lack the factor of necessity. Therefore one might

Variance Theory	*Process Theory*
The precursor (X) is a necessary and sufficient condition for the outcome (Y).	The precursor (X) is a necessary condition to the outcome (Y).
A variance theory deals with variables.	A process theory deals with discrete states and events.
A variance theory deals with efficient causes.	A process theory deals with a final cause.
In variance theory time ordering among the contributing (independent) variables - is immaterial to the outcome	In process theory, time ordering among the contributing events is generally critical for the outcome.

Table 3.1: Characteristics of Variance Theory and Process Theory.
Source: Mohr (1982).

not as simple as in variance theories predict or control the outcome. The second factor that distinguishes variance- and process theory is that the first type relies on some kind of operationalized measures of real world phenomena, while process theory takes into account these phenomena as they actually happen. As Langley (1999, p. 692) frames it: "Process data therefore consists largely of stories about what happened and who did what when - that is, events, activities, and choices."

The third differentiating criterion refers to the four different types of causality identified by Aristotle: (1) *Efficient* causality is a positivist definition of a relationship between cause and effect in a temporal sense. The prior cause is the reason for the subsequent effect. An example would be considering a house the effect of the labor of the construction workers involved in its building. (2) *Material* causality is defined as the relation between an entity and its constituent elements. Referring back to the example of the house, its material cause would be the bricks and mortar. (3) *Formal* causality refers to the relationship between the structure of an entity and its form. In our house example, the formal cause would be the architect's blueprints. (4) *Final* causality is the relationship between an entity and its purpose. The example is thus completed by the requirements of the future inhabitants of the house as the final cause (Wendt, 2003). In this classification, variance theory covers efficient causes, while process theory addresses final causes.

Finally, the ordering of precursor events is of critical importance in process theories. Again, this point has to be seen in context with the other three distinguishing factors. As Mohr (1982, p. 60) notes, "as long as the necessary conditions are merely necessary, their role is that of ingredients. Ingredients alone do not convey a sense of explanation. (...) There must also be some instruction for mixing them - a recipe. Recipes generally mandate activities that occur over time and in a prescribed order." Other authors also

state their favor for longitudinal studies when dealing with process theories (Van de Ven and Huber, 1990; Pettigrew, 1990), but in part also mention the possibility to capture past events through retrospective (Pettigrew, 1992).

Thus, the so far conducted discussion of theoretical underpinnings for this research has been geared to a significant degree to the variance theory approach. This becomes most obvious in for the first dimension. It has been argued that three different benefits are necessary and sufficient preconditions for the emergence of IS development networks, just as three different management mechanisms are assumed to be necessary and sufficient preconditions for its frictionless coordination. For the other factors, this orientation is less pronounced, yet still existent. So, it has been argued that the statements about what benefits and what management mechanisms are active in this setting are formulated as *propositions* rather that as sharp *hypotheses* between well measurable variables[13]. This would contradict the perception of this work as being based on a variance theory, as this type of study - at least according to Mohr (1982) - relies on variables. Also for the third dimension, this study cannot be neatly classified as variance or process theory. Here again, one might argue that the proposed benefits are causing the emergence of the IS development network. However, at the same time this network emerges based on the individual agendas (and thus purposes) of the involved participants, which again hints towards a process theoretical view. The final dimension is again more inclined towards variance theory. There is not (yet) a clear recipe how the theoretically developed ingredients are mixed in the IS development network. Thus, it can be argued that the study follows a variance theoretical approach, yet being in many aspects also in accordance with a process theoretical approach. Such *hybrid* models are typical for IS research Shaw and Jarvenpaa (1997).

3.3 Data Collection

After fundamental choices for the here applied research strategy have been discussed so far, the final two sections of this chapter are concerned with the data collection and analysis processes. The first step in this process is the already described deliberate selection of the first case (termed *purposeful sampling* by Patton, 2002). As this case promises to be setting the course for the remainder of the study, this selection is highly important. As it has been argued in Section 2.1.2.3, the hub organization is of prime importance for the overall IS development network. Thus, the first case should be one of these hubs. As it has also been discussed already, the IS development industry can be characterized as an *oligopoly* market, in which a couple of large, globally acting corporations dominate the market (Farhoomand, 2006). Consequently, the first case is one of these globally acting corporations. Thus, the first case is selected due to the

[13] Which is a crucial part for a *good* hypothesis for Kerlinger and Lee (2000).

fact that it's a crucial case for the research questions, one "that can make a point quite dramatically, or [is], for some reason, particularly important to the scheme of things" (Patton, 2002, p. 236).

The first case fulfills the requirements posed of this critical case very well. The company has a proven track record of developing standardized IS for over thirty years. With thousands of customers in over one hundred countries worldwide it can be characterized as a truly global company. Finally, with multi-billion dollar revenues, it is truly one of the leading organizations in IS development[14].

In this first case, a round of interviews has been conducted during the spring and summer of 2007. In this round, overall sixteen professionals from various positions in this organization have been interviewed. One interview has been conducted with a member of the top management group of this organization, two interviewees have a more technical background, four are part of the company's marketing organization, and nine are actively involved in the partner management in some way. The overall structure of the interviewees of this first and the subsequently conducted cases is illustrated in Figure 3.4.

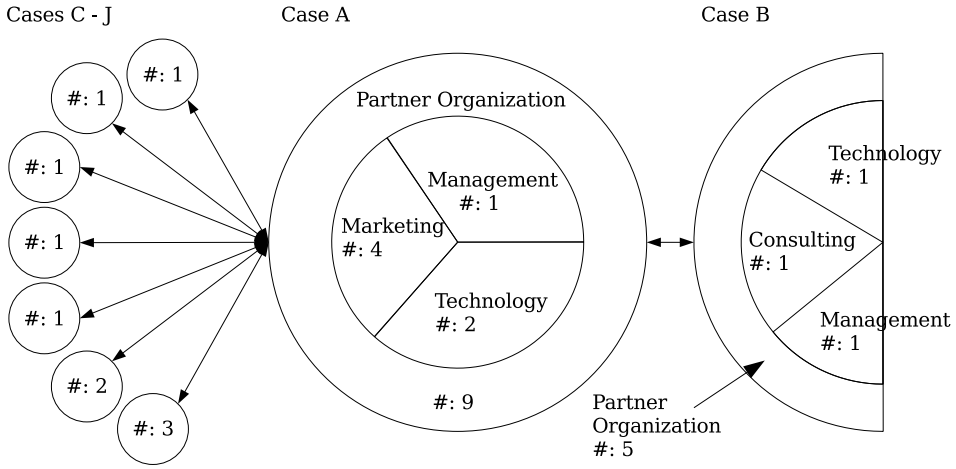

Figure 3.4: Overall Structure of the Cases

These interview partners have been obtained through what Patton (2002) calls *snowball or chain sampling*. In this sampling procedure, preceding interview partners are explicitly asked for further knowledgable interview partners. Then these are interviewed and again asked for further interview partners, and so on. This procedure also has a built-in mechanism for determining when enough interviews have been conducted. As

[14] It is acknowledged that this description of the first case company is rather superficial. However, the fact that in the oligopolistic IS development industry only a handful of companies would render any confidentiality of company information that has been promised useless. See Stone (1978, p. 150 ff) for a discussion of the importance of confidentiality especially in organizational research.

Patton (2002, p. 237) phrased it, "the chain of recommended informants would typically diverge initially as many possible sources are recommended, then converge as a few names get mentioned over and over." This has been exactly the fact, when the fifteenth Interviewee in Case Company A mentioned that all relevant aspects of the partner organization have been covered through the so far conducted interviews. This also conforms with the other advice Patton (2002, p. 244, emphasis added) gives, that "there are no rules for sample *size* in qualitative inquiry" and that ideally, inquiring should continue until no new evidences emerge, which has been the case in the sixteenth interview.

Due to the fact that all interviewees are professionals that scheduled some of their spare time for the interview, it has been attempted to keep the duration of the interviews deliberately short. As a rough guideline the interviews have been intended to last about one hour. For the first case, the actual interviews had an average duration of slightly more than this one hour. The shortest interview was half an hour long, while the longest lasted for one and a half hours. After the assurance has been made that the data will be treated anonymous, all the interviewees of the first case have agreed to tape recording the interview. Subsequently, for each interview a verbatim transcript has been prepared, which has then been sent to the interviewees to give them opportunity to make individual changes to the transcripts. Most interviewees did not make any adjustments, some clarified their statements, some also removed sections which they wanted to be treated confidentially. The final result of this data collection process is a qualitative data base with more than 180 pages of transcribed interviews with close to 110,000 words. Furthermore, eight out of these sixteen interviewees provided additional information such as official company statements, but also internal reports or individually designed illustrations or figures. All these documents are used for drawing conclusions concerning the first case study.

After this initial case study, a second case has been selected as literal replication of the first. As a literal replication of the hub role, the second case company also fulfills the requirements of that role in the network. That is, it is also a large, globally acing, multibillion dollar company that has been selected. Again parallel to the first case, a similar round of interviews has been conducted in that company. The number of interviewees has been limited in this second case to eight, again from various different areas of the company. This limitation has been justified, because much of the knowledge that has been initially developed through the interviews in first case could also be applied in the second case. Also after these eight interviews, convergence of potential new interview partners as well as of addressed topics could be observed. The interviews also have been intended to last about an hour, which has been slightly outrange with one hour and seven minutes on average. The shortest interview has been 55 minutes, while the longest lasted about one and a half hour. Again, anonymity has been ensured to the interviewees and all of them have agreed on tape recording the interview. Verbatim transcripts have been made of all tapes, and again the interviewees had the opportunity to adjust their own

interview. The overall data collection resulted in a data base with close to 130 pages of transcribed interviews. The total word count is almost 70,000 for the second case. All in all the second case can rightfully be considered a literal replication of the first.

After this literal replication, several more *theoretical* replication case studies have been conducted. As Yin (2003, p. 47) argues these replications are supposed to "predict contrasting results but for predictable reasons." The predictable reason for diverging results from these cases is the fact that they are intentionally not *hub* organizations, but rather *spokes*. As it has been a key requirement for these organizations to be of small or medium size, this has been one of the key criteria for the selection of the case companies. In this context, it had to be ensured that the selected companies are no subsidiaries of larger, perhaps even globally acting cooperations. Another constraint has been that, in order to make sure that the selected companies indeed participate in an IS development network, only those have been selected that are officially part of Case Company A's partner network. Finally, in order to allow for interviewing employees of these organizations only those have been selected that are located within a reachable distance to the author. This approach is probably best subsumed under the heading of *criterion sampling* as it is described by Patton (2002, p. 238).

In total, 27 companies that fulfill the above described criteria have been contacted by phone and asked whether they wanted to participate in this study. If a general willingness has been expressed these organizations have been further informed in writing, and a personal meeting for conducting an interview has been scheduled. After this procedure an overall of eight companies have actually participated in the study. The conscious criterion to select small companies resulted in a further problem. As some of the spoke case companies had even less then twenty employees, it has been impossible to acquire more than one interview partner for six out of the eight cases. For the other two cases, two and respectively three interviews have been conducted[15]. Similar to those in the hub cases, on average the interviews in the spoke cases also lasted about an hour. Two interview partners did not give their approval to tape record the interview. Accordingly for these two interviews no verbatim transcript could be made. Rather, comprehensive notes have been taken by both the author and an assisting graduate student that has been brought along specifically for this task (Patton, 2002). For all the other interviews, verbatim transcripts have been made, and the same procedure as for the two other

[15] This is especially problematic due to what Yin (2003, p. 75) calls "undesired confusion between unit of data collection and unit of analysis." Under this heading, Yin (2003, p. 76) describes the fact that "confusion begins because the data collection sources may be individual people (...), whereas the unit of analysis of your case study may be organizational (...) - a frequent design when the case study is about an organization." Thus, similar to the approach of the two hub case analyses, also for the spokes other materials, such as official documents are also used. However, again owing to the ensured anonymity of both participant and their organizations, these documents are only implicitly used and not directly quoted.

cases has been followed in order to ensure the interviewees' approval of this transcript. Overall, the transcribed interviews for the spoke cases resulted in a total of 85 pages and more than 50,000 words of qualitative data.

3.4 Data Analysis

In the following chapter, this qualitative data base is analyzed in order to draw conclusions first of all on the developed propositions, but also going beyond those. Before describing the procedure used in the context of this work, it seems appropriate to loose a few clarifying sentences on the underlying epistemological approach taken. Indeed the dispute between *positivist* and *interpretative* stances seems to be especially prevailing for case study research[16]. The basic idea of pure positivism is that all human thinking and knowledge can be derived from sensation, i.e. the use of the human senses (Friedman, 1999, p. 89). Thus, one can argue that all ideas can be logically composed from experience. Taking up the example of Hanfling (1981, p. 10), a 'golden mountain', although not a realistic concept, can be imagined by logically joining the ideas of gold and mountains, two formerly known concepts. Thus, taking the concept to another stage, it is obvious that, by further and further breaking down ideas into their basic components, one ultimately has to arrive at basic statements that are impossible to be further analyzed. These basic components, which are immutable, objectively given structures and objects, can be, through simple observation, verified to be true or false[17]. Therefore, turning the concept upside down, every complex theory or concept can be proven to be true or false by breaking it down into its basic components, observing if these basic components are found to be true, and analyzing if the basic components are composed in a logical and realistic way.

Pure Interpretative research in contrast assumes that such ultimately verifiable basic components do not exist. Rather the research derives knowledge from interaction with the research objects. Orlikowski and Baroudi (1991, p. 13) argue that "reality, and our knowledge thereof, are social products and hence incapable of being understood independent of the social actors (including the researchers) that construct and make sense of that reality." Furthermore, they state that "the researcher can never assume a value-neutral stance, and is always implicated in the phenomena being studied. Researchers' prior assumptions, believes, values, and interests always intervene to shape their investigations." Along the same lines, Soeffner and Hitzler (1994) argue that the human environment, which influences the understanding and interpretation of reality, is by no means restricted in any way. It is rather a constantly evolving concept that

[16] Similar to the discussion on different research strategies above, also no clear definition exists for epistemological approaches. Denzin and Lincoln (2005) for example consider positivism as one out of four distinct interpretative paradigms in qualitative research. The subsequent discussion is thus not intended to give a holistic overview over epistemological issues in general. It therefore contrasts the two approaches as for example in Lee (1991, and the there quoted literature).

[17] See also the discussion between *normative* and *positive* statements in Section 2.3.1.3.

moves with the individual, that changes, when the individual changes, and that is closely interdependent with the individual. Therefore, they argue that interpretative research is at the same time universal and relative. Universal in a meaning that principles that are used are of general validity. Relative in a way that the application of theses principles, might yield - depending on the situation of the individual - different results.

In this context, IS research commonly uses a more positivist approach[18]. This has been explained for example by Gadenne (1997), who argues that the IS research community is, as it is largely influenced by reference disciplines, split with regard to the epistemological approach used. One part of IS research is often is grounded in physical, technological, or mathematical foundations, which make the use of positivistic research appropriate. However, the other part of IS is, because it deals with the triad of humans, tasks, and technology, considered to be rather a part of social science, than one of natural science. Accordingly, positivistic research is not as appropriate as interpretative research[19]. This is well reflected in the fact that a vast majority of literature supports the argument that a more interpretative approach would improve the overall quality of research in IS Lee (1999); Klein and Myers (1999); Serafeimidis and Smithson (2000); Butler (1998); Orlikowski and Baroudi (1991); Gadenne (1997). The present study thus tends to be more interpretative in nature.

Thus, the advice of Dube and Pare (2003, p. 597) that "one of the keys [for rigorous case study research] is to include better documentation particularly regarding issues related to the data collection and analysis process," has to be considered carefully in the light of their focus on *positivist* case study research. However, as the usage of the word *pure* in first two passages of this section, as well as the precautious statement that the present study *tends* to be *more* interpretative already indicate, no empirical research approach should be considered to be purely either the one or the other. Rather, "in the actual practice of empirical research, we believe that all of us (...) are closer to the center, with multiple overlaps" (Miles and Huberman, 1994, p. 4 ff).

This interpretative background has to be considered in the subsequent description of the data analysis process. Following Patton (2002, p. 463), the first step in such a qualitative data analysis process "involves identifying, coding, categorizing, classifying, and labeling the primary patterns in the data. This essentially means analyzing the core *content* of interviews (...) to determine what's significant." The content analysis in the

[18] Vessey et al. (2002) found in their study on diversity in the IS field (that addressed a total of 488 articles published in the five year period 1995 - 1999) that only 4.7 percent of all the examined articles had an interpretative background. However, this is even an increase in comparison with an earlier study, that found only 3.2 percent of the articles having an interpretative background Orlikowski and Baroudi (1991).

[19] This does not mean that a positivistic approach is not used in this context, even if not entirely appropriate. Western culture in general, and specifically the scientific culture, is firmly rooted in a long, historical, positivistic tradition. This results in a climate in which, "knowledge claims that are not grounded in positivist thought are simply dismissed as ascientific and therefore invalid" (Hirschheim, 1985, p. 3).

present study is based on the theoretical framework[20] developed in the preceding chapter, a common approach to avoid data overload (Miles and Huberman, 1994). In order to achieve this goal, *codes* have been developed for the theoretically developed propositions. "Codes are tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study. Codes usually are attached to "chunks" of varying size - words, phrases, sentences, or whole paragraphs" (Miles and Huberman, 1994, p. 56). Thus, each of the propositions has been assigned a brief label: *Innovation*, *Technology*, and *Market* for the benefits explaining the emergence of the new industry structure; *Standardization*, *Monitoring*, and *Personal Relations* for the mechanisms used to manage it. With the use of this scheme, the transcripts of the interviews have then been coded. Obviously, this is not an easy task, as it "involve[s] both technical and creative dimensions. (...) No abstract processes of analysis, no matter how eloquently named and finely described can substitute for the skill, knowledge, experience, creativity, diligence, and work of the qualitative analyst" (Patton, 2002, p. 466). Furthermore, this process of content analysis can be expected to be a reoccurring one, in which passages are constantly re-coded until finally a set of interview passages emerges for each code. Indeed, all the interviews had to be read several times until the passages have been assigned the appropriate code. As coding has in part changed throughout the reading, this process has been supported by a software that has been used to dynamically re-label the passages.

Once the coding has been stable for consecutive readings, the coded interviews have been used in a twofold way, as is has also been described by Crabtree and Miller:

> Once a codebook has been prepared, different approaches may be taken for using the codebook, in particular: (a) using codes as data management tool in which segments of similar text are printed for subsequent reading and analysis, and (b) coding text and then counting the frequency of different code occurrences as a means of identifying key areas for further investigation (Crabtree and Miller, 1992, p. 95).

This twofold analysis also refers to the above made distinction between a positivistic and an interpretative epistemological approach. The first round of counting frequencies is more positivistic in that it attempts to measure the importance of each of the given category of benefits or management mechanisms and draws conclusions about the research questions from this understanding of the constituent parts. This approach is not an uncommon part of case study research in the field of IS (Dibbern et al., 2007; Sherif et al., 2006).

[20] Since the study is based on an existing framework, it is *deductive* in nature. This has already been mentioned in Section 3.2.2. As the discussion in this section shows, the unfolding research process is deductive only in a first step. At a later stage a inductive reasoning is conducted. Such an two-staged approach is not uncommon in exploratory case studies (Miller and Crabtree, 1992; Patton, 2002).

However, as it has been argued above, this study is intended to be more interpretative. Thus, the counting of frequencies is only considered to be the first of two analyses. This for two reasons. First, especially for the hub cases, the resulting data base of coded interview fragments is still extensive. Second, and probably even more important, the sheer number of passages in an interview that are relevant for a certain proposition is a very limited indicator for determining the significance for this proposition. This has been very well described by Stake (1995, p. 32) in his discussion of different degrees of complexity in coding schemes: "The simpler the datum [that is coded], the easier it is to develop distributions and statistical analyses. The more complex the item, the more individual interpretation it will need when analyzed." Thus, the here conducted analysis of interview fragments can only be in part based upon quantitative analysis as those mentioned above. This difficulty of quantitative measures on qualitative data has also been recognized by Miles and Huberman (1994, p. 56): "Converting words into numbers and then tossing away the words gets a researcher into all kinds of mischief." Thus, as it has been stated above, the more decisive aspect is the interpretative analysis of the *content* of these passages, which does not readily lend itself to numerical descriptions[21]. Therefore, a second round of analysis is conducted in which the underlying background of each fragment is carefully considered in the light of each proposition. This two-legged process is also common for both organizational (Lee, 1991) and IS research (Dibbern et al., 2007; Sherif et al., 2006)[22]. It is thus reflected in the subsequent case analysis. Here, first the pure frequency of fragments that are relevant for each proposition is discussed without regarding the context of these fragments. Then, in the following detailed, rich case narratives, the most descriptive interview fragments are quoted in order to illustrate exactly this context found in each specific case.

However, that fact that this data analysis process is to a considerable extent based on individual interpretation also very well reflects *the* key challenge in qualitative case studies. Obviously, the determination of which passage is supporting or not supporting which proposition to which degree has to be cautiously considered as not being entirely objective. This is probably even more the case for the determination of the specific role that each fragment plays in the context of a given proposition. From a positivist standpoint, it could be argued that this reduces the *reliability* of the here conducted study. Reliability in the context of case studies has been defined by Yin (2003) by the fact "that if a later investigator followed the same procedures as described by an earlier investigator and conducted the same case study all over again, the later investigator should arrive at the same findings and conclusions." However, here again the interpretative nature of the present study and the advice to be aware of the epistemological orientation of

[21] In this context, the above mentioned warnings to force qualitative data into quantitative measures that has been raised for example by Mintzberg (1979a) or Pettigrew (1992) have to be re-emphasized.

[22] The ambiguity and fuzziness of this approach, and thus also its difficulty, is well illustrated by the fact that Miles and Huberman (1994, p. 254), who have argued for a careful usage of numerical measurements above, state that "doing qualitative analysis of all data with the aid of numbers is a good way of testing for possible bias, and seeing how robust our insights are."

cited references has to be emphasized. The second edition of the book written by Yin has been labeled "an excellent guide for a more quantitative approach" to case studies by Stake (1995)! Thus, what is considered as weakness from a positivist perspective is considered to be an integral part of case study research by the more interpretatively oriented community. Stake (1995) for example takes this difficulty as reason to consider case study research as an art rather than a craft. Patton is arguing along the same line, when he states that

> there are no formulas for determining significance. No ways exist of perfectly replicating the researcher's analytical thought processes. No straightforward tests can be applied for reliability and validity. In short, no absolute rules exist except perhaps this: Do your very best with your full intellect to fairly represent the data and communicate what the data reveal given the purpose of the study (Patton, 2002, p. 433).

This advice has to be heeded even more, as the coding of the interviews has revealed that there are no clear cut boundaries between the benefit categories as well as between the management mechanisms[23]. Rather, often an interview fragment that belongs to one category also belongs to another[24], denoting a *link* between the two. Thus, after this first *deductive* inquiry, a second round of *inductive* inquiry is conducted in order to shed more light on the relationships between the proposed benefits and management mechanisms. Here the proceeding is similar to that of the first inquiry. Again, codes have been assigned to either the relationships between the benefits or the management mechanisms. Then, in a second evaluation round those fragments have been selected that very illustratively show these relationships. These are then quoted in the end of the corresponding case discussions. Again, it can be argued that both parts of this selection process are not entirely objective. However, in order to counter this partial subjectivity, another advice of Patton (2002) is followed. He recognizes that an important part of qualitative research is the development of findings that go beyond what the interviewees are conscious of. One way to test these findings is indeed to present them to the interviewees:

> The best and most stringent test of observer constructions is their recognizability to the participants themselves. When participants themselves say, "Yes, that is there, I had simply never noticed it before," the observer can be reasonably confident that he has tapped into extant patterns of participation (Lofland, 1971, p. 34).

[23] In the terms of Patton (2002, p. 457) this might indicate that both categories are *typologies* rather than *taxonomies*. The latter "completely classify a phenomenon through mutually exclusive and exhaustive categories (...). Typologies, in contrast, are built on ideal-types or illustrative endpoints rather than a complete and discrete set of categories."

[24] The facilitation of this *multiple coding* of one interview fragment has been described by Miles and Huberman (1994) as a key advantage of using a computer-based coding software, such as it has been done here.

Thus, as a last test, the final version of this work has been submitted to all the interviewees for additional remarks and adjustments. The interviewees have approved this work, and thus also given their implicit consent to the developed typologies. After this description of different research strategies, the selection and description of the case study approach as the most appropriate one, and the discussion on the data collection and analysis procedures, the following chapter now addresses the actual empirical analysis of the data collected in the different case companies.

4 Empirical Analysis

After having discussed the methodological approach chosen for this study in the preceding chapter, in the present chapter the actual data analysis is conducted. In this context it has been emphasized in the literature on multiple case study research that each case should be first of all analyzed as if it were the only one. Stake (2006, p. 1) comments on this phase of multi-case research with the word that "during work on the single case, the collection of cases remains mostly at the back of the mind." Only after the single cases have been analyzed in due depth, a cross-case analysis addresses similarities and differences between them. However, as the present study addresses two groups of cases (hubs and spokes), a slight deviation from this approach is considered fruitful. Rather than first analyzing *all* cases and then drawing conclusions across them, this chapter is subdivided into *three* large sections.

The first is the analysis of the hub cases. In the first two parts of this section, each of the hub cases is analyzed with regard to the research objectives as if it would be the only case. Then, in the last part of this section, the cross-case analysis of the hub cases is conducted. In order to truly understand the role of hubs in the IS development network, both similarities as well as differences between the cases have to be discussed here. The second section then follows along the same lines for the analysis of the spoke cases. Again first a brief narrative is developed for each of the eight individual cases with regard to the research objectives. In a second step these cases are integrated into a cross-case analysis of the spoke organizations. Here again both similarities and differences between the spoke cases are discussed in due depth. Finally, both perspectives are integrated in the last section of this chapter. This develops a holistic analysis with a special focus on the interactions between hubs and spokes in the entire IS development network.

4.1 Hub Cases Analyses

In this section the two hub cases are first analyzed in-depth without regard to the other case. In this context, each case narrative is again subdivided into three sections. The first, introductory part of each case analysis is a brief report of how the partner strategy in this company developed over time. This section is intended to gain deeper understanding each case company and give the reader a better impression of the contexts for the subsequent case analysis.

Following this, the first research question is addressed. Here, the propositions that have been developed in order to give an answer to the question why organizations participate in such an inter-organizational IS development network are considered in the light of the empirically collected data. As the propositions have been deliberately phrased in

a very open-ended way, the two main goals of this section are to find evidence for the proposed benefits, as well as to more clearly define them. This especially entails the establishing of relationships between the proposed benefits. The theoretical discussion has assumed that all three proposed benefits are equally important and concurrently causative for the emergence of these networks[1]. Whether this relationship can also be found in the collected data remains to be shown.

After this, the third part of each case analysis is concerned with the second research question. Again, various mechanisms for managing such a network have been proposed from a theoretical perspective. Here again, first an analysis is conducted, as to clarify whether - and in which form exactly - these (or potentially other) mechanisms are actually applied by the different case companies. Then, in a subsequent step, the collected data is also used to discuss the relationships between these different mechanisms.

The third research objective has been to answer the question of whether the network is managed in accordance with the goals that the organizations have of their participating. Thus, relating the goals or reasons for participation - discussed in the second part of each case - with the mechanisms for managing the relationships - discussed in the third part - promises to give an answer to exactly this research question. Taken together these four parts of the individual analyses promise to yield exactly the rich description of each case that has been demanded in the preceding chapter.

After the two hub cases have been analyzed individually the final step is the cross-case analysis of these two. This analysis sheds more light on the question whether the two hub organizations follow along the same lines in their decision to foster such an inter-organizational network, as well as in their way to manage it.

4.1.1 Case Company A

4.1.1.1 Network Development

The partnerships of Case Company A have been developed already early on in the history of this organization. Indeed, even the very first systems of Case Company A never have been developed without necessary input from partners. The solutions of Case Company A have been developed during a time when the integrated approach to supply a holistic system from the chips, over the software, to sales and distribution as it is sketched in Figure 2.3 has already been history. Rather, the systems relied from an early stage on infrastructure like for example hardware and also data bases that have been supplied by companies specialized on exactly these components. Thus, in order to guarantee a high-performance system, Case Company A started to partner with these hardware and data base companies from the very first day of its existence. As interviewee A5 comments on this development:

[1] This is, also in the following context of management mechanisms, characteristic for the chosen variance theoretical approach.

> We are developing software now for quite some time. The first important partners have been, back in the days, technology partners. Because we have decided that we are not developing hardware, we are also not developing data bases or operating systems. So, it has been clear from the very beginning that we want to partner somewhere. (Interviewee A5)

Thus, from its early beginnings, Case Company A had to make a deliberate choice concerning the important question of the scope of the systems that it develops (Gawer and Cusumano, 2002). The focus that Case Company A chose for its systems has been that of standardizable business applications. Interviewee A12 argues that making this choice early on has been of crucial importance for the development of Case Company A.

> In the beginning every company that develops software is small. Just like Case Company A. Case Company A has started to develop software for just one customer. So it wasn't really a software *vendor*, but rather a software *developer*, individually tailoring software for one customer. But then the founders of Case Company A had the vision to re-use this software. The software had the capacity for being deployed at different customers. This was an innovation and it has been accepted by the customers. Through this model, in the next couple of years, Case Company A has turned into a global company. Just like many of our competitors and partners. All of them have started small and have made some right choices, have understood the customers very well, have the ability to think in global structures, have a really clever management, and they made it. (Interviewee A12)

However, this also entails the fact that Case Company A has been very well aware of the fact that they cannot develop all necessary parts of the system themselves. Especially the above mentioned hardware and infrastructure software, like operating systems or data bases, has never been in the focus of Case Company A. Furthermore, another component that is of prime importance in this context is the fact that the systems developed by Case Company A have been and still are highly complex. They therefore offer a multitude of opportunities for individual adjustment by the customer. However, as it has been discussed in Section 2.1, the goal of organizations that are implementing a standardized IS has been exactly to avoid the individual tailoring of their systems. Consequently, a large consulting industry has evolved that exactly addressed these issues for customers of Case Company A. Through these consultancies, industry-specific know-how is available that allows customers to adjust their system specifically to their needs. Interviewee A8 summarizes this development as follows:

> Then the question came up how to scale customer projects? With time the answer to this question has been that we have entered into strategic partnerships with consultancies. These consultancies then have conducted -

> more or less - a major part of the customer projects, the consulting in the field, the installation of the entire system, the customizing, the go-live, etc. (Interviewee A8)

Thus, Case Company A has a long history of being involved in software *ecosystems* as they have been described for example by Messerschmitt and Szyperski (2003). This at first glance seems to run counter to the assumptions that have been made in the introduction. Namely, that the IS development industry has been characterized by increasing consolidation and that the systems developed in this industry have been subject to a trend of encompassing ever more functionalities. Indeed, from the very beginning, the early developers of these systems have been very well aware of where they draw the boundaries of their systems. In this context it has to be especially differentiated between providers of hardware or infrastructure software and those that develop the business functionalities. While the intense partnering has been nurtured with the first group, this has not been the fact for the latter group. Here, the system in itself has not been developed in an inter-organizationally modular fashion as it is supposed to be the fact of the here described IS development network (see Section 2.1.2.3). Yet, this background of intense partnering in other fields gave Case Company A considerable experience with alliance management, and also ensured that the system has been, at least in part, already developed through a modular approach:

> From the very first day, we could only grow in such a way as we did because of the partners around us. Early on that led to an openness, both in our architecture as well as in the mindsets of our employees. (Interviewee A8)

Consequently, it has only been a matter of time that mainly the involved consultancies, but also other organizations, started to seize the opportunities that this openness gave them and started to develop their own, standardized business applications (see also Campbell-Kelly, 1995). This development has already started during the 1990s. As Case Company A so far has made good experience with partners in different categories, newly joining software partners have been appreciated and interfaces have been deliberately opened for them. However, as it has been discussed in Section 2.1.2.4, this cooperation has been rather cumbersome, as all partners had to individually connect their solution to one of these interfaces. Yet, the recent emergence of SOA has exactly changed this and thus, taken the partner strategy of Case Company A to a new level:

> Then, during the 1990s, more and more software partnerships emerged with companies that have augmented our system. We always had open interfaces, but the sheer number has increased significantly up to today. (Interviewee A5)

> One thing is - and we also say that in our official communication - that Service-Oriented Architectures have revolutionized our partner strategy. The idea behind that is, that (...) attaching third party solutions now is much easier than it has been in the past where everything had to be interconnected individually. (Interviewee A6)

Thus, the ideas that the organizations that develop complex IS are adopting a more inter-organizationally modularized development approach also with regard to their specific system focus can be approved from the perspective of Case Company A. The subsequent section now addresses the first research question, of analyzing reasons why such a large IS development company like Case Company A is following such an approach. Or, as Interviewee A11 phrased it pointedly:

> Before we go into all the details of software partnerships, it maybe helpful to give you an overview of why as a software company, we need software partners? (Interviewee A11)

4.1.1.2 Reasons for Participating in the Network

Throughout the next couple of pages, the data collected in Case Company A is analyzed with regard to the reasons why the organization not only participates in, but actively fosters an IS development network. First, the propositions on why hubs partner that have been developed theoretically in the second chapter of this study are thoroughly examined. Here it is especially tested to which degree each of the developed factors is a driver for this emerging network. This procedure follows the description given in Section 3.4. In Table 4.1 the number of interview fragments that have been coded for each of the benefit propositions is listed.

As this table shows, ample support exists for the relevance of all the propositions. Again following the procedure as it has been sketched in Section 3.4, not all of these fragments are given in the following case narrative. Rather, only those that best illustrate the propositions are quoted. Then, foreclosing one of the findings of this first analysis, it has already been stated that this variance theoretical approach is not able to fully explain the phenomenon of an emerging networked structure in the IS development industry. Rather, these reasons cannot be addressed independently of each other. They are closely intertwined and in part determine each other. Thus, going beyond the proposed variance theoretical approach, the empirical data is used to develop a process view that incorporates all these factors.

Innovation Benefits. In a nutshell, it has been argued in the theoretical part of this study, that one of the key drivers for the emergence of an IS development network is the ability to tap into innovations that are not developed within an organization's boundaries. From the data collected in Case Company A, it can be safely stated that indeed

	"Innovation"	"Technology"	"Market"
Interviewee A1	2	1	1
Interviewee A2	0	0	0
Interviewee A3	5	1	1
Interviewee A4	0	4	5
Interviewee A5	5	4	5
Interviewee A6	2	1	0
Interviewee A7	0	2	1
Interviewee A8	2	3	2
Interviewee A9	1	3	1
Interviewee A10	2	0	6
Interviewee A11	7	3	8
Interviewee A12	2	2	6
Interviewee A13	7	1	8
Interviewee A14	1	4	2
Interviewee A15	3	2	1
Sum	39	31	47
Average	2.60	2.07	3.13

Table 4.1: Relevant Interview Fragments by Benefits: Case Company A. Source: Own Assertion.

this is one of the driving themes behind the network strategy of this organization. Interviewees A13 and A6 even see this fact as the main impetus of the currently developing network strategy.

> It comes down to the recognition that we needed a new innovation model. And that owning all the innovation is no longer possible. This has happened across so and so many different industries. [Another organization] is big on their connected development approaches, where they recognized that the vast majority of innovations are happening outside the four walls of their organization. If you restrict your sources of innovation to those within your organization, you're definitely going to fall behind. (Interviewee A13)
>
> It is surely the dominating goal to bring fresh blood into the company on a regular basis, to tie innovations that emerge somewhere in the world to us. (Interviewee A6)

From a theoretical perspective, one of the reason why large hub organizations, like Case Company A, are partnering with smaller companies lies in the fact that - by virtue of their smaller size - these companies possess the agility and flexibility that a large hub organization cannot realize. In this context it has been argued to be especially important

that these organizations potentially possess the *entrepreneurial spirit* that is necessary to successfully pursue innovative ideas (Baumol, 2002). Again, the content analysis of the data collected in Case Company A clearly supports this proposition why large hubs partner with smaller partners:

> We cover most of the necessary applications. Those which satisfy really global requirements, which everyone, or at least almost everyone, needs in various different industries. However, if it's really a local or narrow functional requirement, smaller companies surely have the advantage that they are much more flexible and innovative, that they can develop a new product within two months. (Interviewee A5)

> Next practices are those highly innovative solutions that we do not want to develop. And also those that we actually cannot develop, because the flexibility that a small company has, cannot be copied by such a large organization as ours. This is a nice mechanism to integrate innovations into our system very fast. (Interviewee A6)

As these quotes show, support for the proposition that the ability of smaller partner companies to increase the pace of innovation is a key driver for large hub organization to participate in this kind of inter-organizational network can be easily found in the collected qualitative data. Besides the ability to conceive innovative solutions, another aspect has been addressed as being of prime importance in this context: That of deploying the innovative solution at the customer. As competitive pressure on customers continues to increase, they are constantly looking for new opportunities to achieve a competitive advantage (at least a temporary one, see the discussion on the resource-based view). As IS are often strategic instruments to achieve this goal, their flexible adaptation is key:

> If you look at the market from our customers' perspective, they are increasingly facing hyper-competition with a lot of pressure to reduce costs and also to differentiate themselves. So, they're constantly innovating. So, one thing we need to do - as IT provider - is to support them in that process. (Interviewee A11)

Thus, the fact that innovative solutions are only valuable in the moment they are successfully deployed at the customer plays an important role. The fact that the historic, monolithic systems of the past have only been able to address this point in a very limited way has been well recognized in Case Company A. Either innovation has to be conducted on a system-wide basis, which is a rather cumbersome and slow process, or the system has to be individually modified, which is a highly expensive process.

> You cannot do this any more like it has been done in the past: I have a large, monolithic system, which I update every five years. I simply cannot do this any faster, it's simply not a profitable endeavor. However, I need some kind of a process with which I can differentiate myself. And I need that process now. It's not sufficient to state that I need five years to implement this process. (Interviewee A8)

> So, the question is how to *quickly* assemble new solutions that allow me to differentiate myself in an innovative way? In most cases, these solutions are not a standardized part of the platform. The standardized platform covers 80 - 90 percent of the entire system. However, the other 10 - 20 percent, that is where you can differentiate yourself. Up to now, this differentiation is realized through modifying this large, monolithic block of a system. This is expensive in the consequential costs. (Interviewee A8)

Thus, evidence has been found that supports the proposed (innovation) reasons why large hubs participate in such a network, both the development and the deployment part of this process. However, it has also been implicitly included in the above quotes that these innovativeness is not necessarily a desired end-goal of Case Company A. Rather, only if these innovative solutions are integrated with Case Company A's system and are also successfully deployed at customers, they are beneficial for Case Company A. Thus, in the following especially benefits of the integration of specific technology are analyzed in a similar way.

Technology Benefits. The second proposed benefit for the hub organization has been that the access to certain technologies of other companies is driving the decision to partner. In this context it has been argued that these technologies can be either *complementary* or *supplementary* to the hub's platform. As the subsequent discussion shows, integrating complementary technological functionalities into the existing system is indeed one of the reasons for Case Company A to embrace the networked strategy. This integration of new functionalities that are deliberately not offered by Case Company A, can again be sub-classified into two categories. The first is integrating those technologies that are covering functionalities that are out of the scope of the product portfolio of Case Company A. These are especially solutions that offer functionalities which are not offered by Case Company A. However, as these functionalities often need to be integrated with some of the solutions that Case Company A has developed, there is substantial interest in seamlessly integrating these different solutions - both from Case Company A and the partner.

> There are systems for all industries that are reaching very far into the specific niches, into the specific processes, into the specific technologies. We are in contrast specialized in the business processes. For all solutions that control the technical processes, for example the actual production or things like that,

> we offer interfaces that can be used to integrate the data of these solutions into our system. However, we will not offer any software that is covering, in an integrated way, these processes. (Interviewee A9)

In this specific context, an integrated system that allows for a continuous control from a business to a technical perspective is a desirable goal. As Case Company A is not developing any of these technical machines, partnering with providers of those functionalities is the ideal way to realize this goal:

> Let us use the example of manufacturing execution systems. The goal here is to make our software communicate better with the embedded software on the production lines. As the software that is running on the machines is developed by those companies that sell the machines, partnering with these companies allows us to completely integrate integrate the whole business process from the business application to the machine. So, whenever I have to cancel a customer order the production planning is appropriately adjusted. (...) These are partnerships that are rooted in the fact that we want to integrate our systems with other solutions, such as those that run on these machines; or material management, we do not produce warehouse control systems, but we have software that integrates with these. (Interviewee A5)

As the applicability of these general business solution packages is very broad, there are a multitude of these industries, in which specific solutions exist that are deliberately not offered by Case Company A, and in which a "bridging to other technical worlds" as one interviewee framed it, is necessary. Among those that have been mentioned throughout the fifteen interviews are the already mentioned manufacturing and execution systems and computer aided design systems for industrial production, but also for example foundries, healthcare, mills, laboratories, or the diary industry.

The other instance in which Case Company A is not interested in offering a certain solution, are those cases in which already a well established de-facto standard exists. Even if this solution might be considered as core to Case Company A's offering, the dominating position of the other company makes a partnering the best possible solution for both companies.

> If there exists a certain de-facto standard, the question is raised as to whether you should develop something yourself? Do you need to build your own infrastructure and technology for this specific solution? In some examples we decide that no, that we should enter into a strategic partnership and to integrate an existing de-facto standard very tightly into our own solutions. That makes it easier for us, as we are offering a solution that is, because it is the de-facto standard, very well accepted by the customers. This also gives our partner the opportunity to gain access to a new group of customers that they have so far not addressed. (Interviewee A8)

As many specific niche applications have already reached a status that can be described as de-facto standard, this type of partnership is not really a rare one. Again, and this explains the classification as *technology* benefit, many of these are of a technical nature:

> Okay, for the business applications you have our system. You can modify this system to a considerable extend so that you can cover most of your requirements. However, the very special solutions, such as scanning, archiving, fax functionalities, such things, we have integrated those things from other suppliers from the very beginning on. (Interviewee A9)

Therefore, it can be argued that access to certain technologies is indeed a driver for the fostering of organizational networks by large hub organizations. However, the nature of these technologies is not necessarily the superior ability of partners, as it has been anticipated in Proposition T_H. Rather, the deliberate choice of the hub organization not to supply specific technologies, either because they are tightly integrated with other technologies, such as certain machinery, or because a well established de-facto standard exist, is the critical aspect which differentiates what is part of the hub's systems and what is supplied by partners. Thus, there is ample support for the *complementary* part of this proposition. Whether there is also support for the *supplementary* part remains to be shown. Furthermore, again similar to the discussion of innovation benefits, the integration of complementary technologies is not an end in itself. Here especially the necessity to sell these integrated solutions to customers is playing a key role and leading directly to the last discussed aspect - market benefits.

Market Benefits. The final factor that has been developed in the theoretical foundation as key driver for the fostering of an IS development network by the large hubs is the access to new markets that would otherwise be foreclosed for these vendors. As Table 4.1 shows, this factor is the one that has been mentioned most often by essentially all the interview partners:

> It is basically the goal not to have to address the entire breadth. Rather, we want to utilize the emerging partner networks for this broad market coverage. (Interviewee A4)
>
> Of course we cooperate in partnerships in order to conjointly open up new markets. (Interviewee A9)
>
> Now we have partners for many, many different markets. Every partner has market-specific enhancements in order to make our system even more valuable. The partner is adding value that we could not add. He has the local or regional access and long-term expertise in this market. (Interviewee A10)

> For us to penetrate deeply in new markets, we cannot do it alone. We just don't have the resources to do it alone. So partnerships become extremely critical. We work with partners to come up with the right solutions, and to go-to-market with them. (Interviewee A11)

Yet, again this addressing of new markets is similar to the realization of innovation or technology benefits. It is not an end in itself. However, the accessing of new markets is already very close to what should be considered the final goal of Case Company A's partner strategy, the generation of new revenue streams:

> Addressing new markets, I would frame that as generating new revenue streams. There are new revenue streams associated with having a network of partners and offering this platform. We're looking at new ways to monetize this platform. (Interviewee A13)

Thus, the final goal of the partner network can be assumed to be the generation of new revenue streams through the addressing of new markets. This fact, which should come as no surprise, since the participants in the IS development network are for-profit organizations, has been mentioned in one way or another, by all the sixteen individuals that have been interviewed:

> It [the partner strategy] has to result in that we can better sell our solutions, that customers better accept these solutions. How many [partner solutions] are being used? How much revenue has been generated through this over the last year? With how many customers has this revenue been created? Is that good enough? Does it give a good return for both partners, etc.? In the end it is a question of money, or new customers, or new users, these are the key indicators. Okay, obviously new customers and new users generate new money. But it has to bring some measureable effect. That's what all partnerships get evaluated on. (Interviewee A8)

> In the end it is very easy - it is all about potential additional revenues for us. We are selling business application software, period. That's what we're doing. With surrounding services, but key is the application software. So, how much additional revenues can we generate in a specific time horizon? (Interviewee A12)

So, it can be argued that again significant evidence has been found that supports the proposition that gaining access to new markets is a key driver for the participation in and the fostering of an IS development network for large hub organizations. However, it has to be stated that the proposition, as it has been originally phrased, does not hit the mark of why hubs actively foster those networks. Addressing new markets is not an end in itself. Rather, the key driver can be seen in the fact that the accessing of new markets

is a necessary precondition for generating additional revenues for Case Company A. This is well reflected in the already discussed fact that the traditional markets of large IS are largely saturated and that the newly addressed niche markets (like SMEs) have very specific needs that cannot be completely included in the standardized package:

> If we want to enter into the mid-sized to very small markets we need a very different type of system. Easier, faster, etc. to install, and that paired with the local presence of the partners. (Interviewee A10)

> Until recently our focus was the traditional core enterprise application markets. Now, our goal going forward is to significantly grow our market share in existing markets and penetrate new markets. Hence, we're looking at a much larger pie and we want to get a significant share of that. The only way we can grow that fast is through partnerships. So our focus is, build a core business process platform, which includes the core applications, and also provide infrastructure, the tools, the web services, such that other nimble software companies can leverage that and build new applications, or integrate their current applications well enough. Hence, the customer gets a solution that is the best suite, which is Case Company A's suite, plus best of breed in terms of industry. (Interviewee A11)

Thus, summing up the so far discussion on benefits of participating in an IS development network, it can be stated that the theoretically proposed benefits have been found to be of prime relevance in this context. This albeit the fact that some of the propositions could not be supported in the way in which they originally had been formulated, but rather had to be specifically adjusted to the context[2]. Especially the interactions between the three factors have posed a severe difficulty for the chosen variance theoretical approach. Rather than being independent of each other, temporal dynamics exist that reduce the explanatory power of such an approach.

Thus, rather then analyzing the factors that motivate organizations to participate in these IS development networks independently of each other, it is probably more important to analyze the dynamic relationships between these factors. As it has already been mentioned throughout the discussion above, innovation, technology, and market access/revenue generation are all tightly interwoven with each other. The rich and multifaceted data that has been collected throughout the interviews is therefore subsequently analyzed in order to especially shed more light on these dynamic inter-connections be-

[2] This is again owing to the exploratory nature of this study that has been discussed in Section 3.2.2. The propositions have deliberately been framed as *propositions* and not hypotheses, with the possibility in mind that they are likely to need a re-phrasing during the research process.

tween the already discussed aspects[3]. As it has also been mentioned, as the factors are in part in temporal progression to each other, these inter-connections are assumed to be best addressed through a process perspective.

4.1.1.3 Towards a Process View on Network Participation

The perception that all three proposed benefits, the accessing of innovativeness, technology, and markets, are important in the context of Case Company A has been mentioned throughout the various interviews. However, further analysis of the data has shown that not all motives are equally important for all partners. Rather, different kinds of partnerships were identified: Some partners were loosely attached to the network, others were tightly connected; some partnerships existed only for a brief time span, others were long lasting. Studying these differences, it has been revealed that the static perspective only insufficiently explains the underlying patterns of network formation. Rather, the partnerships between hub and spoke were found to go through various stages, which are characterized by these differences in the cooperation. In this context, the above discussed three motives were in fact not drivers for the this network formation, but rather *events* that triggered the transition between the stages in this developmental sequence[4]. Thus, the following paragraph is intended to go beyond the individual analysis of these factors, and to uncover how they inter-relate and what this means for the present case. From a thorough analysis of the collected data it has become obvious that the three factors and the relationships between them form a partnership process, as it has been discussed under the label of *process theory* by Mohr (1982) and under the label of the *third meaning of process* by Van de Ven (1992). In the following, this developmental sequence is exemplarily traversed and corroborated with empirical data from Case Company A.

[3] This is also in-line with the selected research design of a case study, "in which important discovery occurs during the conduct of one of the individual case studies" (Yin, 2003, p. 50) and which consequently is inherently equipped with a relatively high degree of *emergent design flexibility*, which has been defined by Patton (2002, p. 40) as "openness to adapting inquiry as understanding deepens and/or situations change; the researcher avoids getting locked into rigid designs that eliminate responsiveness and pursues new paths of discovery as they emerge."

[4] As it has been mentioned in Section 3.2.4, it has been assumed that the present study can neither be considered purely variance- nor purely process-theoretical in the framework of Mohr (1982). However, this statement can no longer be upheld. First, it has been recognized that the three proposed benefits are *not* variables, but rather events. Second, these are *not* necessary and sufficient preconditions for the emergence of IS development networks. Finally, the sequence of these events indeed plays an important role. Thus, the here proposed model could be assumed to be a pure process model. However, this view is not the absolute truth. Rather, the events are in part determined by variables - how important is an innovation for customers, how well is it integrated with the platform of Case Company A, how complementary or supplementary is it? These are varibales that describe the impact that the here described events have on the overall process. Referring back to the taxonomy of hybrid models proposed by Shaw and Jarvenpaa (1997), it can thus be argued that the following passage clearly described a Hybrid Model I. This type of model closely resembles a process model, but mixes variables and events. This recognition is equally valif for the discussion on Case Company B, below.

The first step in this partnership process is the emergence of an innovation[5]. In this context, it can be argued that partner innovations are not theoretical concepts or ideas. Rather, only those innovations are interesting for Case Company A that are already existing software solutions. This already hints upon the sequential nature of these relationships, as Case Company A is very conscious of its final goal of revenue generation. Especially when interviewees are talking about innovation benefits, they are well aware of the Schumpetrian nature of innovations that has been discussed in Section 2.2.3.1. Throughout the interviews it has been repeatedly mentioned that the IS development network is not intended to act as development aid for small start-ups.

> Partners are supposed to be profitable. That is they should have a certain track record in their market. The partner program should not help someone to gain a foothold in the market. We are no incubator for those who want to establish themselves in the market (...). We do have other programs for that. The standard partner program does not exist to bring someone without any infrastructure into the market. (Interviewee A9)
>
> We won't go to market with a partner product that's not validated, both technically and business wise. We don't put ourselves into that kind of situation. (Interviewee A11)

Thus, the first step in the partnership process is that of turning innovative ideas into a piece of software technology[6]. There are essentially two ways how such an innovative solution can emerge. Either it is consciously identified by Case Company A and its customers and deliberately left to a partner to develop. Or it emerges without conscious knowledge from Case Company A from the vast number of Independent Software Vendors (ISVs) that act in the industry.

> How do we bring innovations to market? We don't do everything by ourselves, but enable co-innovation. We cooperate early on with customers to identify upcoming topics and requirements that are of importance within the next year or so. Then we decide on how to best deliver this together with partners. Either way it is integrated with the rest of our systems from the very beginning. (Interviewee A5)

[5] Selecting innovation benefits as the first step is obviously an arbitrary choice. However, it is very intuitive to start a process with the emergence of something new. Therefore this choice has been made.

[6] One can argue about whether this is actually the first step in the partnership process of Case Company A, as this is supposed to happen without intervention of this organization. However, as an existing software solution is required for participating in the network, it is seen here as the first step.

> And we look at so-called white spaces, where we don't have functionality, and where there is emerging greater customer interest. And often there are a variety of partners, software solution partners in particular, who either have a solution or are developing a solution that is addressing this white space in a compelling fashion. (Interviewee A13)
>
> Our focus is increasingly to enable innovative solutions to be developed out there and that we don't know about. (...) So that one day, when there's a market disruption, that solution is already there and we can effectively leverage the solution for our customers on our platform. (Interviewee A11)

Once the innovative solution has emerged, the logical next step is to make its functionality available within the platform of Case Company A. Thus, it has to be technically integrated with the existing overall system. That this technical integration of partner functionality is another key driver for the Case Company A has already been discussed above. Thus, once these innovative solutions have emerged, no matter whether this happen through a concise plan or through mere happenstance, the next step in the partnership process is their integration with the entire system. Interviewee A11 very well illustrates this interconnectedness between innovations and integrating them with the overall system through the following two examples. In each of the examples a partner has developed a solution that has to be considered innovative in the context of Case Company A. Then, in a next step, this innovative functionality has been made accessible from the entire system through a technical integration.

> We have a partner who does incentive management. Most of the incentive management and compensation management they do is in the financial and high tech industries. We have a very good footprint in those industries in terms of other solutions. However, this is a unique solution, which is getting a lot of market traction and a lot of our customers like it. Therefore, we looked at that company in terms of their management capabilities, in terms of their strategy, revenue, and customers feedback. We realized that it is a good solution to be part of our network. That's how we approach it. It's not that they open up a brand new market for us; we already were in high tech and finance. But it's a fact that they bring a unique solution to the table which fits very well with what we are already offering to our customers. A solution that a customer sees a lot of value in, and especially sees a lot of value in working in conjunction with our solutions. (Interviewee A11)
>
> One of our partners' solution is focused on capturing real time data from the plant floor. We have an example where the customer is a big dairy manufacturer. So our partner's solution is providing information all the way from the cow, where the milk comes from, to where it is bottled and shipped to the distribution center, and on to the retail shelves. So, they handle a lot of plant information and at the same time the customer uses our system

> for business applications. The customer wanted to get real time visibility for their executives to look at any point and see, how the plant production is, inventory, demand etc. They accomplished this by integrating a lot of data captured by the partner's solution into our system. Now, the customer can be sitting in his/her executive suite and be looking at how much milk has been produced in a particular plant today and where it is and in what stage it is, how the inventory is and how that converts into euros in revenues. So that's another case where we decided not to be in the business of providing plant floor information in the dairy industry. But here is something where a customer gets a lot of value through having integration between us and an ISV like that. So that's the reason why it makes a lot of sense for us to work closely with the partner. In some ways it's complementary and for customers it makes sense if both the solutions work together effectively. (Interviewee A11)

The examples cited above also indicate what the final step in the partnership process is: That of generating value for all the involved parties. Thus, as the final goal of Case Company A is the generation of revenue streams, innovative ideas not only have to be turned into software solutions that have been integrated with Case Company A's system. They have to be turned into integrated, *marketable* software solutions. These integrated, marketable software solutions are finally those that Case Company A is looking for, as these drive revenues up. Interviewee A13 has explained the ideal partnership as being driven by customer requests:

> We're looking for customer deals where there's a partner solution that doesn't just look academically interesting because it conceptually fits into this white space, but where we actually have customers craving for this kind of functionality. We don't have it today, here's a partner that has it, and they've already certified their application to be interoperable with ours. So it's largely based on what our customers are telling us and what are the resulting opportunities for us. (Interviewee A13)

However, what is already implicit in the words "we don't have it *today*" is the fact that this successful relationship does not necessarily continue infinitely. It has been discussed as one of the fundamental idiosyncrasies of IS development, that IS are intellectual goods, which can be endlessly innovated. Closely related to this perception has been the idea that IS development is therefore an inherently dynamic field. Therefore, network relationships are subject to constant change and thus, constant re-evaluation. As Interviewee A12 phrased it:

> The relationship between us and our partners not necessarily has to continue steadily. The markets change, and just like we have to change, our partners also have to change. (Interviewee A12)

Thus, once the partnership process - from developing an innovative solution, over integrating it with the overall system, to successfully going to market, has been passed once, it does not necessarily lead to a stable industry structure in which certain partners assume the responsibility for developing certain components. Rather, the stability of partnership relations is achieved only for some of these components. Thus, there are essentially two potential development paths: Either the relationship continues unchanged, or the hub is deciding to enter into the market that the solution of the partner is addressing.

The first case is the one that has, at least in part, been described in the paragraph on technology benefits. Case Company A has a deliberately chosen strategy, which components are developed internally and which are sourced from partners. The most prominent examples for components that are sourced from partners are those solutions that are either very technical, which already have an established de-facto standard, or both. These solutions are developed by partners on a continuous basis. If this type of clear-cut sharing of tasks exists in the relationship to a partner, there are no objections for this relationship to continue almost infinitely. The stable nature of these relationships has been described through various examples in the interviews.

> In the easiest case we have a partner that is developing hardware, servers and let's say an operating system. That's not what we are doing, so we are very relaxed, both organizations' developments continue in coexistence. We have agreed that we do our thing and the partner does his thing. And to the best of our knowledge this will not change for the next twenty years. (Interviewee A12)

> In the technology field we have been cooperating with some of our partners for more than fifteen years. We have long lasting relationships with those partners who supply for example the servers or the databases. We have selected the market leaders in every single field and cooperate with those. And as this is a business model in which the partners earn their share, there is not a single partner that has left the network. (Interviewee A14)

Thus, Case Company A does not have an inherent interest to go into those markets. However, as the solutions developed by Case Company A use the infrastructure that is provided by these companies, a partner relationship is important to guarantee a high performance of Case Company A's solutions running on this infrastructure, just as it has been described in the introductory passage of this case analysis. Very similar to this type of relationship, are those partners that develop infrastructure software solution. Mostly, Case Company A does not consider these to be a crucial part of its portfolio. Again, relationships of this type exist in the network, and they have already been discussed in the section on technology benefits:

> We have decided not to go into archiving, that one of our partners is supposed to do this. This has been and still is a wonderful symbiosis. Until today we have never addressed archiving. That is a very fruitful relationship. (Interviewee A12)

Furthermore, another type of partnership exists that is very similar to technology or infrastructure partnerships: Those with providers of small niche solutions. This type of partner solution is in principle included in what Case Company A considers to be the scope of its system. From a hypothetical scope consideration, they could thus be classified as *supplementary* components. However, as the market that is addressed by this specific solution is too narrow, Case Company A does not intent to include this type of solution into its generic, standardized system. Thus, considering the actually realized scope of Case Company A's system, these solutions have thus to be classified as *complementary* components. Here again, the partner relationship between Case Company A and the providing organization of this niche solution is not restricted in its lifespan.

> In case that a partner enters into the market of business applications, which is inherently our market, there are two possibilities. The first is if the solution is a niche product and always stays a niche product. Then this is uninteresting for us. Niche products are often very country-specific and not replicable into other countries or regions. If this is the case, the partners actually have a very easy life. (Interviewee A12)

This stability in the relationship to Case Company A does not mean that the entire network really continues to develop unchanged. However, if partners are subject to change, this change is not initiated by Case Company A. Rather, dynamics internal to the industry segments that these partners operate in sometimes result in changed partnership relations:

> The partner might get acquired by a competitor within their niche. But that is none of our business. (Interviewee A12)

The so far discussed cases are those, in which the solutions developed by the partners are complementary to those developed by Case Company A. This can be the case because the solution is providing a technical functionality, or because it provides a functionality that is not considered attractive by Case Company A. If this is the case, the relationships are rather stable. However, there are also those cases in which this is exactly not the case. These cases are inherently very similar to the above described niche functionalities. The key difference between these two cases is however, that in the complex and dynamic IS development industry the functionality that is covering a niche today does not necessarily have to remain in this niche tomorrow. Thus following the above described temporal dynamics between accessing innovations, their technical integration, and the successful go to market, there is also dynamic change of organizations thriving and perishing within

the network. Case Company A is well aware of these dynamics within its industry and is constantly checking as to whether partner solutions are indeed leaving their niche and becoming general purpose solutions.

> These might be functionalities that initially have been part of a niche, but which are generalizable, which are getting on our radar screen because a lot of customers ask us to include them into our system. Then this niche partner has to recognize that his solution is becoming a commodity. (Interviewee A12)

> We are analyzing the market for standardized software that might be interesting for us because it is within our scope. We start with a market analysis; we watch the markets. Is the problem something that can be and should be addressed with a software solution? If yes, is it standardizable, or is it different, e.g. from country to country? There are some areas which have only one potential customer in each country, and each of these customers has very specific requirements. This asks for a classically custom built solution. We do not touch this. Then there are other areas which are inherently standardizable, but which we have not yet addressed, simply because we had other things to do. (...) There are multiple areas in which suddenly a potential for standardized software is emerging. So it is imperative for us to monitor these areas and to make decisions (...) as to whether we are offering solutions for these markets or not. These things are happening permanently. (Interviewee A12)

So, in the cases in which the partner functionality is promising to become a generalizable solution, which is not confined to certain niches, the partnership process as it has been described above is inherently a cyclic development. Once a technical integration of the partner solution has been realized and conjoint market success has been achieved, the subsequent step for the partner is to outspeed the developments of Case Company A. Especially solutions that are mass-marketable are highly attractive for being not only integrated, but absorbed into the overall system. The main idea of how partners can prevent being absorbed into the overall system is through relying once more on their agility and flexibility that has been discussed as a key driver for their innovative solutions. The overall context of this relationship is very well illustrated by the following quote of Interviewees A13 and A12:

> We do a market analysis and then communicate to our partners, here's a place where we do not intend to go, in the near term. We don't provide a life-time guarantee. It might be that over time the notion of what's in our system and what's on top of our system is a very dynamic landscape that evolves over time due to a variety of factors. As a partner to be successful you need to stay on the edge, you need to add value to the system, and

> that's not a static thing over the long run. But at least over the short run we can tell the partners, these are areas that we do not intend to focus on. (Interviewee A13)
>
> Those who recognize this change and act out of a position of strength, simply because they have the money to do so, are on the right track. Those that remain in the status quo, run the risk of getting in trouble. (Interviewee A12)
>
> The question is who will survive? In such a model those partners will survive that are very close to the customer; those that have very good knowledge; that are accepted by the customer for developing new processes or new services; and that can develop those very efficiently with a reuse factor. Otherwise it does not work. That is the positive model. (...) Those that will loose something in this model, are those that are not so close to the customer, those that are not so innovative, the *after sales* or *me too* partners. (Interviewee A12)

The final question that remains to be answered is what is happening with those partners that are not innovative or flexible enough to stay abreast of the developments of Case Company A? This context has been described by one of the interviewees as a simple make-or-by decision. The first option is to develop a solution independent of what has been developed by the partner. The second is to simply acquire the partner and to integrate this acquired solution with the people that have developed it into the system. The latter case seems to be more attractive, especially for the partner. Yet, both cases have happened during the history of Case Company A, as the following quotes show:

> If we recognize that the partnership has ceased to make sense, it is better to terminate it. You can even terminate partnerships entirely. One historic example shows this very well. We had a very big partner for a certain solution. Then we have decided that this specific solution is a too important topic, that we have to add this to our own solution portfolio. With this decision, it has been clear that this partnership will cease to exist. It even changed from a very close partner model to a very intense competition. That has happened. (Interviewee A12)
>
> In other cases it has been the fact that certain topics have not been that important in the past. In a very recent example we have acquired a partner. Before that we have integrated their solution on a partnership basis. At some point in time, we have recognized that this solution is indeed crucial for our system and that we cannot leave this to others. (...) So we have reacted to our customers who have said that this topic is very important and that we ourselves have to offer a solution, if we don't want to loose certain business opportunities. This change obviously also had an impact on the partner network. (Interviewee A12)

> Especially smaller and mid-sized partners might have the goal to become so attractive through their solution that we want to acquire this partner. There are different exit strategies for partners. It might be a goal to stay independent partner forever. But it might be another goal of a partner to get acquired. (Interviewee A8)

However, in both of these cases the company ceases to exist as an independent part of Case Company A's partner network. Thus, it can be argued that the partnership process of Case Company A is a cyclic one. It starts with an invention that is developed by a partner. Once it becomes clear that this invention is attractive for some customers, it can be technically integrated with the platform of Case Company A. This integrated solution is then expected to be successfully sold in the market. Once this market success has been achieved the next step depends on the nature of the partner's solution. If it is a technical or niche solution the partnership continuous to exist as long as it is successful in the market. If Case Company A decides that the solution is supposed to become part of the platform, it either develops its own solution that copies the functionalities of the existing partner solution. Or it outrightly acquires the entire partner. If partner organization's management wants to stay independent, it is then required to come up with a new invention, and the process begins anew. The overall structure of this partnership process is also illustrated in Figure 4.1.

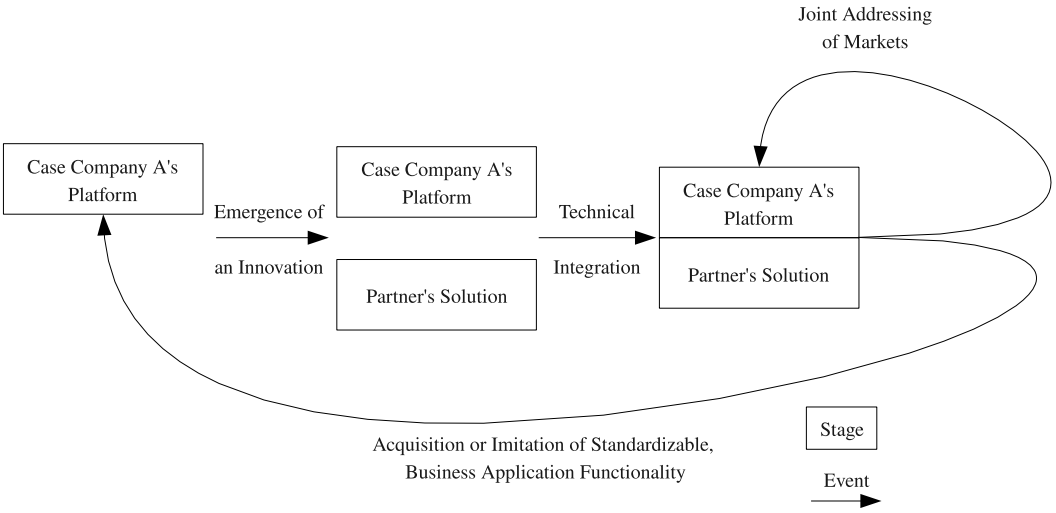

Figure 4.1: The Innovation Cycle in IS Development for Case Company A.
Source: Own Illustration.

This first section of Case Company A's analysis has focused on answering the research question why this company not only participates in but even actively fosters such an IS development network. As it has become obvious, the reasons for this strategy cannot be fully understood from a variance theory perspective, but rather the entire life cycle

of such a partnership has to be examined. The result of this analysis of the partnership process has been described above. However, another implication of this discussion is the fact that - contrary to what has been discussed in the theoretical part - Case Company A can no longer be assumed to develop different partner categories in accordance with the different proposed benefit categories. If a reasonable classification of partners exists, it should be based on the potential revenues that a partner generates for Case Company A. Whether this differentiation is indeed happening, and what different management mechanisms are applied in these different types of relationships are topics discussed in the following section.

4.1.1.4 Management of the Network

The following section addresses the mechanisms that Case Company A utilizes to manage the relationships in the partner network. Similarly to the approach to this first research question, the subsequent discussion also relies on the propositions that have been developed on the basis of the theoretical preconceptions discussed above. As a first step in this data analysis process Table 4.2 shows the number of interview fragments that have been considered relevant for each of these management mechanisms.

	"Standardization"	"Monitoring"	"Personal Rel."
Interviewee A1	1	0	0
Interviewee A2	0	2	0
Interviewee A3	1	0	0
Interviewee A4	2	0	1
Interviewee A5	2	9	6
Interviewee A6	1	1	2
Interviewee A7	0	1	6
Interviewee A8	1	2	5
Interviewee A9	1	7	2
Interviewee A10	0	1	3
Interviewee A11	6	2	3
Interviewee A12	0	2	1
Interviewee A13	6	3	4
Interviewee A14	1	1	4
Interviewee A15	4	2	1
Sum	26	33	38
Average	1.73	2.20	2.53

Table 4.2: Relevant Interview Fragments by Management Mechanisms: Case Company A.
Source: Own Assertion.

Here, again good support could be found for all theoretically developed propositions. Also following the already discussed process, not all of these interview fragments are quoted, but only those considered most illustrative. Again similar to the proceeding of the last section, these theoretical preconceptions are used to guide the research, not to determine its outcomes. Wherever appropriate, concepts are adjusted to the research findings derived from the empirically collected, qualitative data. This also includes a second part of the discussion of the mechanisms of standardization, monitoring and relationship building. In this second part, links between these categories are discussed and conclusions about their inter-relationships are drawn.

Standardization. It has been proposed in the theoretical part of this study that the participants in the inter-organizational IS development network are assumed to prefer standardized over proprietary approaches. The fact that this coordination mechanism promises to be among the easiest and cheapest to implement has been well recognized by Case Company A. As Interviewee A15 framed it:

> At the end of the day we do have a multi-vendor landscape [in our partner network]. That involves a range of very general problems, and our answer to many of these problems is of course, standards. (Interviewee A15)

The first aspect of standardization that has been mentioned is the reliance on standardized technologies, such as those that are part of SOA. These technologies promise to facilitate coordination as outputs are standardized, as well as to reduce transaction costs, as physical assets specificity is reduced. The fact that SOA is seen as a key impetus for the emergence of such organizational structures has already been discussed. That the rationale behind this is to a large extent standardization has also been acknowledged by the interviewees in Case Company A:

> What is SOA actually? In the end SOA is the opening of standardized, well documented interfaces that allow you to use close to the entire functionality of the existing system. (Interviewee A4)

> A key idea behind SOA is the fact that we have standards. That means that we can utilize the entire system and that we can attach third party applications much easier than in the past, when everything had to be custom built. (Interviewee A6)

> One of the advantages of SOA is that it is based on general industry standards. The core of SOA is that you can use open standards like WSDL, UDDI etc. (Interviewee A11)

> One big topic in the context of SOA is standards. That addresses a very fundamental problem. We have to know how a sales order looks like. If we don't know how it looks for vendor A and how it looks for vendor B, the partnerships become extremely inefficient for us. And there are a lot of industries which do not have any standards. (Interviewee A15)

The importance of the development of these standards for integrating third party applications is well recognized by Case Company A. Thus, first the organization actively interacts with standard setting organizations in order to ensure that the applied standards are up to date. This also includes the active participation in these standard setting organizations wherever possible.

> We also work on industry standards. We engage with industries more broadly to figure out how do we stay appropriately open so that we conform to the most important standards and comply with those. Where do we exercise leadership and where should we perhaps take a different path? (Interviewee A13)

> Of course standardization addresses one of our fundamental problems. This is also the reason why we are participating in all these bodies which define standards and attempt to establish some kind of uniformity. (Interviewee A15)

However, as it has been argued above, IS development is an inherently very complex endeavor. Consequently, reliance on standards promises to be only one first step in the management of these complex relationships. For example the necessity to exercise reasonable care that these standards are also consistently upheld in the IS development network has been mentioned. This aspect has to be attended with due diligence.

> One of the goals of these technical standards is to ensure that all our partners have the same starting basis. What you will see often is that some of those partners use their relationships to attempt to open special solutions only for themselves. There you have to be really strict, either it is part of our official offering and everyone can use it, or no one. (Interviewee A8)

Thus, standards can contribute significantly to the reduction of frictions in the IS development network, and are consequently utilized by Case Company A as one of the key management mechanisms in this context. However, they can do so only if they are accompanied by other management mechanisms. The two other approaches that have been developed in the theoretical part are monitoring and relationship building. Both are subsequently discussed.

Monitoring. The second aspect how such a complex network of relationships can be managed is the mutual monitoring of partners. As it has been discussed in the theoretical part of this study, especially the concept of partner *certification* is an important monitoring device in an inter-organizational setting. Consequently, in almost all interviews certification has been a topic in one way or another. In this context, various potential certifications exist. However, as it has been discussed in the theoretical part of this study, what is exactly *not* certified are complete organizations. Rather, only very specific aspects of these organizations are certified.

> What we are not doing is certifying an entire organization. It is mentioned every now and then that we do this, but it is not true. We certify capabilities of the organizations, either of their employees or their products. (Interviewee A9)

Whereas all these certifications are important for the cooperation, the one that is deemed most important for this study is the certification of (software) solutions. Even this certification of solutions is a very complex task so that solutions are only certified depending on the current state or condition of a software version.

> And so, when partners go about certifying their solution for our system this solution becomes a certified solution. We don't certify the partner. We certify the solution. (Interviewee A13)
>
> If you have ten solutions out of which only one passed the certification process, then only this one solution is certified according to our interface and product standards. (Interviewee A5)
>
> [We even certify] a certain version of a solution against a certain version of our system interface. (Interviewee A9)

However, even this labeling of certifying a *solution* is misleading. The only thing that is actually certified is the interoperability of this solution with the system of Case Company A. What is *not* certified is the inherent quality of the partner solution. Case Company A even refers to this certification as *integration* certification.

> We do not pretend that we can certify partner solutions. We cannot do this also due to customer liability reasons. We can only certify that the solution conforms with our conventions and that the technical integration is running correctly. That is what we promise with the integration certification of a solution. (Interviewee A9)
>
> We certify solutions for our system in an open program. Our company does not certify the quality or functionality of these solutions, simply because we do not give any statement to customers about the partner solutions (Interviewee A5)

Nevertheless, this certification of technical integration is considered to be the most basic aspect of the entire partner network. This certification of a given solution is a necessary requirement for being recognized by Case Company A as a member of its partner network. Consequently, it is also a key requirement that partners keep this certification updated.

> First, a partner needs to prove that his technical integration is working correctly. That is the key element for software partnerships. As a general rule this is achieved through the integration certification. So, this certification is a fundamental building block [for our software partnerships]. (Interviewee A9)

> The partners who join the network with their certification have to keep this certification updated. They actually break the rules of the partner program if a new version of the relevant interface of our system is released and they do not re-certify their solution for this version within a given period after it is released. (Interviewee A9)

Thus, ex ante monitoring in the form of certification is a fundamental pillar for managing the IS development network by Case Company A[7]. Besides this ex ante monitoring of partners it has also been noted that ex interim monitoring is an important aspect of such relationships. At Case Company A this monitoring is conducted on various levels of aggregation, from a single partner to the entire network. As it has been argued above, creating revenues for Case Company A is the main goal of the partner network. Therefore, revenues are also the most important indicator that is used to monitor the success of the partners:

> So, all these priorities are broken down to the single partner. We have KPIs for each partner, which are then aggregated into groups, which are then consolidated into KPIs for the entire partner management. (Interviewee A6)

> What counts at the end of the day is revenue, revenue, revenue. (Interviewee A7)

> We have a clear controlling of the partner success at Case Company A. This controlling happens for each single country, it gets consolidated for different regions, and then goes up to the very top of the organization. The success clearly shows in the growing revenues that are generated by the partners. But also in the growing number of successful projects or new customers. These are two very clear KPIs that we're controlling. (Interviewee A10)

[7] Case Company A has a very well established opinion of the reason why this is important. As Interviewee A11 phrased it: "Basically we have set up a certification program where we make sure that the different partners' solutions work well with our system. So that we make sure that we are the trusted advisor for customers. So, when an ISV goes to a customer and says we work well with Case Company A and we have the right certification to prove it, the customer should feel comfortable to say, okay if Case Company A says it works, it really works. " This idea has been well elaborated on in the discussion of the market benefits from the spokes' perspective. Therefore this issue is again addressed in the corresponding section of the spokes' case narratives. However, this also clearly shows how closely intertwined the drivers for participating in and the mechanisms for managing the network are. It is thus another corroboration for conjointly addressing these two issues.

> We have mechanisms to measure how much revenues is coming from a particular partner. This is what we're calling incremental revenues. (Interviewee A11)

However, it is also recognized in this context that the potential of monitoring the partners through measuring generated revenues is very limited. As it has been mentioned throughout the theoretical discussion on the topic, ex interim monitoring is difficult due to the idiosyncrasies of the IS development industry. This fact has also been well recognized by the responsible individuals in Case Company A. Interviewee A9 for example mentions the following shortcomings of monitoring the partners:

> It is not really a tight monitoring. (...) At the moment we do not have a well developed measurement of what the single partner is actually doing and how this is contributing to the network. Today we cannot exactly measure this. We do not have access to the partners' operational data. Neither is there any obligation for the partners to show these data to us, nor are we allowed to demand them from our partners. (...) But a tight monitoring whether all partners fulfill our criteria? Whether that is actually happening? We would need more people and highly automated processes for this! (Interviewee A9)

> Today, we cannot really observe what is happening in sales. We sell, our partners sell, and that does not necessarily have to happen simultaneously. A customer uses our partners' software and the customer therefore requires additional licenses from us. That is the optimal case. However, we do not know the inter-relations between these two parts of the process. We cannot determine how big the common customer base is with each partner. Some partners communicate this to us, but they don't have to. And there is actually no way to monitor this, especially not for all the partners and on a permanent basis. At least not with the current size and systems of the partner group's staff. (Interviewee A9)

So, albeit it can be concluded that monitoring the partners plays a pivotal role in the management of the inter-organizational IS development network, there also seems to be no feasible way to make the relationships in the IS development industry completely transparent. Consequently, the theoretical discussion has concluded that a *control gap* exists in such inter-organizational relationships, and that this control gap cannot be closed. Thus, a third management mechanism has been proposed in order to safeguard against partners exploiting this control gap - the building of a trusting relationship with a partner.

Relationship Building. Indeed the building of trusting relationships has been mentioned throughout the interviews at various instances. This also includes the perception that these trusting relationships between organizations can only be fruitfully built on

the basis of close personal ties. Often, these ties are even considered to be the most important management mechanism that Case Company A has for managing the IS development network. Interviewee A7 emphasizes this with the following words:

> The most important challenge in the cooperation with partners is the people component. That both sides trust each other. In the end we are all driven by revenues, we're living on our revenues, the partners are living on theirs. (...) As I said from my perspective this is the most important challenge. (...) If people do not trust me, I will not stand a chance in this business, and it is hard work to develop this trust. But in the end that's also what makes this job so exciting for me. (Interviewee A7)

This relationship building corresponds with the theoretical discussion in several ways. Foremost, it has to be mentioned in this context that these relationships are always based on personal ties between the involved companies' employees. As it has been developed in the theoretical discussion, only if the participants in such an inter-organizational relationship cooperate on a trusting basis in their day-to-day work, the relationship promises to be able to realize its full potential. This reliance on personal relationships is perceived to be among the strongest indicators for a successful relationship.

> Such a partnership has to be a living thing. The best partnerships are those in which the people closely cooperate, where things work well on a personal basis. (Interviewee A5)

> You try to manage the relationship in a way that you're meeting regularly in order to agree on certain KPIs, on revenue targets, on exit criteria, etc. That is a crucial part of such a relationship. (Interviewee A8)

> We have a long lasting partnership with a company that's one of our fiercest competitors in other fields. This partner relationship works very well because it is managed by people who are doing this for ten years. They know the dos and the don'ts very well. On the other hand we have partners which are not even close to being in competition with us. However, they nevertheless attempt to push us into directions that we don't want to go. (Interviewee A14)

The second aspect that is also implicitly included in the last quote is the fact that time is recognized as a crucial dimension for relationship building. It is of prime importance to note that building and, perhaps even more so, maintaining a trusting relationship can only be achieved through a continued effort. The employees of Case Company A have realized this very well, as the following quotes show:

> Of course we know our partners very well through years of cooperation. If I'm talking to a partner, I can tell very well whether I can trust this partner. There are others, I know that if they present me some of their numbers I better have to deduct 20 percent of everything. With time you notice these things. (Interviewee A14)

> I think, at least for my division, but also for my colleagues, we have the relationships to our partners under control. We have built a trusting relationship in the past. But we have to demonstrate that again and again, every single day. (Interviewee A7)

> It is extremely important that we're working hand in glove with our partners and that we're having an open, trusting relationship. This is the linchpin of the entire partner network. (...) Obviously this includes a considerable preliminary effort to ensure this. (Interviewee A7)

The last aspect that is addressed by the reliance on trusting relationships is the special role that the hub organizations are playing in a hub-and-spoke structured network. As it has been argued, the hubs are assumed to have a certain interest in the well-being of their partners, as these are necessary for the overall success of the network. During the interviews in Case Company A it has shown that especially personal relationships to the partners are important mechanisms to realize this partner support.

> For such a partner network it is important to build a trusting relationship. (...) Building this trusting relationship is important to ensure that people treat each other fair and that both sides benefit from the relationship. (Interviewee A8)

> Often, the partner is also on trade fairs so that this is a really tight, trusting cooperation, a real community. In this context you will help your partner to survive bad times. If you see an opportunity to help him out, you will do it. (Interviewee A10)

However, while relationship building is an important mechanism for managing the relationships in the IS development network, it also has to be used with care. Interviewee A9 gives the following cautionary note on relationship building from Case Company A's perspective:

> Informal networks exist in Case Company A, as they exist everywhere. However, we have to make sure that this does not give an unfair advantage to a particular group of partners. We have a policy to treat all partners in our program equally. We have to pay close attention to this, because we are one of the market leaders. These companies are kept under very tight surveillance by the authorities. (...) There is a very close monitoring whether we're influencing the market in a certain direction or not. (Interviewee A9)

Thus, it can be summarized that the reliance on trusting relationships as they have been discussed in the theoretical part of this study, is an important factor in the management of the inter-organizational IS development network. The so far conducted discussion on the management of this network has therefore resulted in significant support for the proposed co-existence of the three mechanisms that have been developed from the discussed theories.

However, similar to the preceding discussion on benefits of the networked approach, also the three proposed management mechanisms cannot be understood as being detached from each other. Rather, very deliberately the mechanisms are applied in different intensity for different partners. As it has been argued in the theoretical discussion of this study, the different management mechanisms come at different costs. Thus, the following section analyzes first whether the different mechanisms are in fact perceived as being more or less expensive as it has been described in the theoretical part. Furthermore, it is also analyzed whether the presumedly 'cheaper' management mechanisms are used more often then those that are more 'expensive,' and how they inter-relate.

4.1.1.5 Developing Relationships between the Mechanisms

The underlying rationale behind the relationships between the above discussed mechanisms is the perception that managing the network requires considerable effort from Case Company A. This very well aligns with the motivation of the second research objective to determine through which mechanisms the network can be managed most effectively in such a way that the discussed benefits are not offset.

> You need more formal coordination with partners in comparison to making it alone. You have to be much more professional in documenting things, in agreeing on targets, in verifying them, in review meetings, and so on. This also results in more overhead. (Interviewee A8)

> It is obviously more effort. You can look at it in a clear-cut, black and white fashion. If we wouldn't have our partners, we could save all those partner efforts that we're currently having. However, then we would miss out on all the benefits and value creation - also for the customers. (Interviewee A5)

In this context Case Company A indeed focuses on the above discussed three management mechanisms. It furthermore classifies the partners into three groups in each of which one of the mechanisms is predominantly used. This has resulted in a three tiered partner pyramid[8]. The lowest segment of this pyramid is the *open* network that has naturally developed around Case Company A. It contains organizations that develop solutions based on the system of Case Company A. However, this in part even without the

[8] This should not mean that at each segment of the pyramid only one of the management mechanisms is used. Rather, at each segment one of the mechanisms dominates and the other two are less distinct.

awareness of Case Company A[9]. As Case Company A cannot be assumed to have a clear understanding who is actually participating in this lowest level of the (potential) partner pyramid, controlling or monitoring this group is similarly impossible as the development of close personal ties. Case Company A does not considered this group of partners to be an integral part in the IS development network. Consequently, the only management mechanism that is active at this level is standardization. Through standardized, open interfaces (potential) partners do have the opportunity to attach their solutions to the system of Case Company A in a relatively easy way. Interviewee A11 sees this segment of partners as the one that Case Company A needs to focus on most in the future:

> Our focus increasingly is to enable innovative solutions to be developed out there and that we don't know about. So that they are attracted to our network and that they can, with a minimum amount of effort, build their solution on our platform. So that one day, when there's a market disruption, that solution is already there and we can effectively leverage the solution for our customers on our platform. In the next couple of years, our focus is to work with a larger set of partners. We will do this by standardizing and productizing a lot of the capabilities. (Interviewee A11)

In the middle segment of the partner pyramid, the mechanism of monitoring is added to standardization. Here especially the certification of specific solutions as it has been discussed above is the most important aspect. Through this certification, an organization is officially recognized as partner, and Case Company A certifies that the solution that is developed by this partner works well with the existing system. As it has been discussed above, this monitoring of partners requires some effort from both sides. Case Company A has to provide the certification scenarios, in part also prepares the partners for certification, and also has to conduct the actual certification process. However, at the same time, Case Company A has a veritable interest in attracting partners into this certification program. Therefore, not a lot of the necessary management effort can be transferred to them, especially not for those partners that provide an attractive solution:

> The statement that we are making is that the solution works well with our system. So there are concrete certification scenarios, which we pass through together with our partners in order to ensure that the solution is really working well with our system. (Interviewee A5)
>
> We have actually published how such a certification process looks like. We also assist in the preparation. We guide our partners through the whole process and tell them what is really important. (Interviewee A5)

[9] Case Company A therefore does not even officially recognize this level as part of their network. However, as these 'partners' are indeed an important part of the network, they are also discussed here.

However, while there are indeed some expenses for this certification process, these are not considered to be critical. Rather, certification is seen as an initial level for partnerships by Case Company A. Therefore, the expenses at this level are deliberately held low.

> The lowest level is achieved through the certification process. In principle that is a pure certification of interfaces. The partner has to connect his solution with our system and has to prove that he can transfer data from left to right. This costs him a couple of dollars. There are roughly two thousand partners that have done this so far. (Interviewee A15)

This degree of effort changes when a partner attempts to reach a higher level of the partnership pyramid. The reason for this can be seen in the fact that for those partners that are member of the final segment of the partnership pyramid, Case Company A not only certifies that the solution works well with their system, but also recommends the partners' solutions to customers. This also includes that Case Company A is, in contrast to the preceding two segments of the pyramid also willing to actively foster relationships in this type of partnership. Obviously this kind of relationship requires yet again much more effort from Case Company A, which is often realized though adding the mechanism of personal relationships to the other two. One direct result of this it the fact that access to this top-tier level of partnership has to be much more restricted than to the other partner categories.

> In a top-tier partnership we're even going to customers to see how the partner solution actually works. We're also having personal meetings with our partners. That is the reason why the number of these partners is much smaller than for the other segments. We want to build a good governance and that is very expensive. But only through this mechanism this kind of partnership works. Only signing a contract, giving out a press release that we're cooperating from now on and nothing happens? That hurts us and it hurts the partner. (Interviewee A5)

> We have to place our partner's solution in the market, we have to communicate this to our customers and potential customers so that they know the solution is there and the solution can do this and that. Of course that entails much effort. (Interviewee A14)

> If you take a look at the top-most level of the pyramid, there we have only one partner for each functionality that we want to add to our portfolio. We only chose the best one. Otherwise we would have a long list of solutions and the effort is ever growing. If I have three top-tier partnerships for one functionality we do have three times the effort. But the question is whether we also have triple revenues? (Interviewee A5)

The entire partner pyramid is illustrated in Figure 4.2. The pyramid indicates that the number of partners decreases as the relationship becomes more intense. The dotted line for the bottom-most segment, as well as the quotation mark around the word 'partner', indicate that this segment is not considered to be part of the partner program by Case Company A. Finally, next to the pyramid are three bars that are suppose to give an idea of which effort is put into which management mechanism for each partner category. These bars are not drawn to scale, they are intended for illustration purposes only.

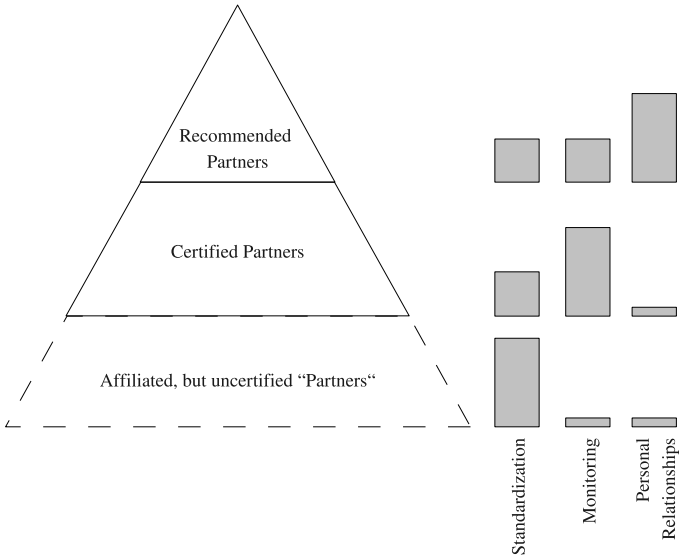

Figure 4.2: The IS Development Partner Pyramid for Case Company A.
Source: Own Illustration.

Summing up the so far conducted discussion on managing relationships in the network, it has been confirmed that Case Company A is using the three proposed management mechanisms. Indeed, three different partner categories exist that are each managed predominantly through one of these mechanisms. Analyzing how this management of partners inter-relates with the above discussed benefit categories has been the third research objective. This is subsequently addressed.

4.1.1.6 Matching Benefits and Management Mechanisms

In the preceding sections good support has been found for the three theoretically developed proposed benefits why Case Company A is indeed participating in and fostering such inter-organizational IS development networks. Also, good support has been found for the co-existence of the three theoretically proposed management mechanisms. However, what has also emerged from the empirical data is the importance of the inter-

connections between these proposed factors. Thus, addressing the third research objective in this section again slightly deviates from the original research question. It has been one of the key findings of the so far conducted study that the three proposed benefits of an inter-organizational IS development approach cannot be considered as separate of each other, but rather form one coherent process that leads to conjoint market success. This also led to the finding that the classification of partners that exists cannot be based on the different benefits that have been discussed. Rather it should be based on the potential that a partner solution has for generating additional revenues for Case Company A. Thus, in the context of Case Company A, the third research objective is slightly re-phrased to answer the question of whether the proposed management mechanisms are appropriately utilized in order to support the inter-organizational innovation cycle in IS development, which in turn culminates in market success. Indeed, this goal is well recognized by Case Company A. As Interviewee A11 comments on the striving for a scalable process:

> We are improving how we support partners effectively, but also make it a scalable process so that it doesn't cost us a lot of money to support the next new partner. Because we have couple of thousand partners, we need to understand how adding another 1000 partners impacts our cost and revenue model. Hence, we're looking at making partner engagement a much more scalable process. That includes the entire process from the time of identifying the partner and developing a joint business plan with them, to going to market with them, what are all the different activities that can be scaled. Because some of the processes are not easily scalable, so that it's very cost prohibitive. (Interviewee A11)

However, in this quote interviewee A11 also highlight the fact that some parts of the process are not easily scalable and that consequently partnerships of the most intense type have to be limited in number. At which point in this partnership process, this necessary limitation can be achieved most easily is illustrated through a matrix in which the two so far discussed dimensions are put on top of each other[10]. Thus, Figure 4.3 is a combination of the two previously developed Figures 4.1 and 4.2. On the horizontal axis, the partnership development process is sketched over time. Similar to the process that has been developed in Section 4.1.1.2, this axis is sub-divided into the three phases innovation, technical integration, and market development. The vertical axis in contrast shows the management mechanisms that are applied at the three levels of the partnership pyramid that has been developed in Section 4.1.1.4. This axis is sub-divided into the three mechanisms of standardization, monitoring, and relationship building.

The process starts with an innovative solution that is developed by one of the (potential) partners of Case Company A. This step has already been described in the discussion on the innovation cycle. This innovative solution is then designed in such a way that

[10] Using cross-dimensional matrices is a common approach to classify qualitative research data. See Patton (2002) for a discussion on this topic.

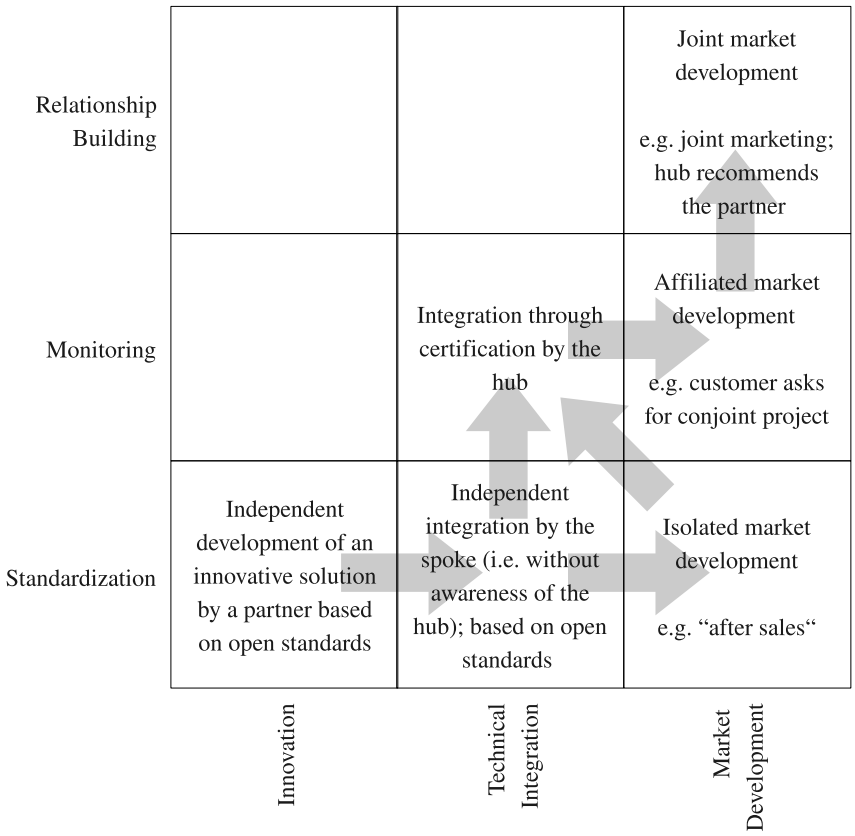

Figure 4.3: The Combined Process Management Matrix.
Source: Own Illustration.

it inter-operates with Case Company A's system. As Case Company A provides open, standardized interfaces, this can be done without the awareness of Case Company A. This integrated solution can then be sold to customers that are using Case Company A's systems - so far still without any awareness of Case Company A. The typical scenario for this kind of process is what Case Company A terms *after sales* solutions.

> The typical after sales partner is selling into our network, but completely independent from us. He waits until a customer has deployed our system, until he has a sound basis of installed solutions, and then complements these with his own. For his own solutions, he can use any kind of technology, you name it. With this solution he is addressing the customer completely independent from us. Sure, this solution is using our interfaces. Great, but that has nothing to do with Case Company A. We do not see this, we do not recognize this, we do not have any relationship at all to this partner. (Interviewee A12)

This process corresponds to the lowest level of the above sketched matrix. 'Partner' development along these lines happens completely without the awareness of Case Company A. However, in this context all the involved parties can be assumed to have a veritable interest in bringing more transparency into this relationship. As it has been discussed, the customers are interested in having a stable, well integrated solutions portfolio. Case Company A is interested in tying the partners to their network. Finally, the partner is interested in being positively recognized by Case Company A's customers. Thus, a possible next step would be to formalize the so far implicit relationship between Case Company A and the partner. This is done through officially certifying the inter-operability between the partner's solution and Case Company A's system, as it has been described above. This process is described by Interviewee A12 as follows:

> The beginning is that I am a simple software vendor. That means I have a solution that does - not exclusively - inter-operate with Case Company A's system. I am a completely independent company, I do not have any relationship to Case Company A. (...) The next step would be that more and more customers of this ISV - remember 'I' stands for 'independent' - demand that the quality of this inter-operability is tested. Case Company A does have a certification program, why don't you let your solution pass through this? If you do this, we can close a deal, if not we have to think about it. (Interviewee A12)

So this certification of the technical inter-operability is the necessary step to take the relationship to the middle layer of the matrix in Figure 4.3. Once this certification is achieved, the conjoint market development that is resulting from this relationship is closer than before. Yet, in this regard, both parties still act to a considerable extent detached from each other. Consequently, these solutions are not (yet) considered key to the software portfolio of Case Company A. Rather, Case Company A only uses this solution (interface) certification as a mechanism to get a better idea of who is acting in its environment and a first entry into the partner network. This has been aptly summarized by Interviewee A12:

> We only need certified partners because our customers need them, because they round off our portfolio. One example is archiving. I doubt that there are customers out there that decide on our system because we have such a great archiving solution. Rather, they decide against our system if we would not have an archiving solution. Other aspects are more relevant for the customers' decision. (Interviewee A12)
>
> Our partner comes to us and lets us certify the interfaces of his solution. Then he gets a logo that we have made a quality check and that his solution really works with ours in certain areas. Okay, great. But what is really

> interesting is, if this ISV sees an added value in developing new solutions or completely re-engineering his solution based on our systems. (Interviewee A12)

Thus, Case Company A is actively looking for successful partners that can be classified in these higher partner categories. In this highest level of partnership markets are addressed conjointly by Case Company A and its partners. This can happen through two distinct ways. First, Case Company A can actively promote the partners' solutions, for example through joint marketing efforts or the like. Contrary to the above described secondary importance of partners' solutions for closing a deal, these recommended solutions are an primary reason for customers to decide for Case Company A's system.

> Partners can certify their solution. Then they can show - mainly through successful customer projects - that they and their solution are highly relevant also for other customers. So coming from the open program a partner can distinguish himself through success stories. (Interviewee A5)

> In the concept of recommended solutions our partners still sell their own solutions. I get a certain fee for my efforts in helping him sell his solution. Why should I actually do this? Because I'm hoping that through these sales a certain drag for my own solutions is emerging! Otherwise I would be crazy. (Interviewee A12)

Second, Case Company A can even go one step further, and actively sell the partners' solutions. In this context the effort that Case Company A is having, is even higher than with only recommending a partner's solution. As interviewee A5 phrased it:

> Obviously the effort is also much higher. We have to develop capabilities especially for this relationship. We are really selling this solution globally, we receive requests from all over the world, we need to translate the solution, we need to document it, we have to support the solution. Because of this the entire relationship is a different one, especially from the business and financial perspective. (Interviewee A5)

Thus, it can be assumed that the goal of Case Company A is to develop partners into these recommended or resold solution partnerships. However, again referring to the idea of an innovation *cycle* in IS development, from a partner perspective, these solutions are also those that are most attractive for being acquired or otherwise absorbed by Case Company A. In Figure 4.4, this consecutive cycle in such a (successful) relationship is briefly illustrated through the arrow leading from the top right corner of the process management matrix to the bottom left corner of a new matrix. In contrast, the certified partners that are more likely to be providing the niche or technical capabilities are also

more likely to co-exist with Case Company A for a longer time horizon. This does not mean that these partners are not innovative. However, this innovation is necessary because of inherent competition within their industry segment. Thus, as long as they keep abreast of their competitors their relationship to Case Company A can continue almost indefinitely. This is illustrated through the arrow staying within the middle right part of Figure 4.4.

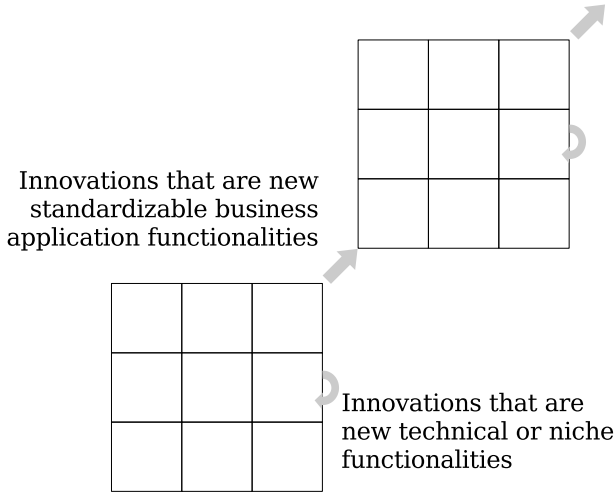

Figure 4.4: Cyclical IS Development Relationships for Case Company A.
Source: Own Illustration.

However, this risk is not a unilateral one. Especially for the reselling partnerships, Case Company A is also incurring high risks. Interviewee A15 exemplarily mentions the risk that a partner is acquired by another company and that subsequently the solution that Case Company A has invested in, is no longer fitting with the other systems.

> Especially today, the acquisition risk is very high. If we rely on a reselling partner, and this partner gets acquired by a competitor, this naturally results in a disruption of the relationship.

Summing up the narrative for Case Company A it can be stated that indeed many of the theoretically developed concepts could be successfully applied in the context of this company - albeit some of them in a different fashion than anticipated. Here, especially the fact that all these theoretical concepts are closely intertwined is highly striking. The relationships that were found have been illustrated in a matrix (Figure 4.3). This matrix not only shows the process of partnership relations from innovation to market development, but also the management mechanisms that can be applied at each of these stages. As the innovation process has been found to be a cyclical one, there

are potentially multiple of these process matrices that can be traversed in a sequential ordering. This is summing up the most important findings for the partner management from Case Company A's perspective.

The following section addresses another hub company in order to develop a similar case narrative to this one. This is intended to verify whether the here developed model is highly specific for Case Company A, or whether it can be generalized for other hub organizations as well. After this verification the other perspective of this study is addressed - that of the spokes. Here multiple companies are analyzed as to their point of view on the topic. In a final step, these two perspectives are then integrated in order to gain a holistic view from an organizational perspective on the entire inter-organizational IS development network, as it has been demanded in the introduction.

4.1.2 Case Company B

4.1.2.1 Network Development

The development of partnerships has to be considered an essential part of Case Company B's history. Especially important in this context is the fact that the company has its background in hardware development. Thus, the first partnerships that emerged had been hardware reselling arrangements. However, during the more recent history, the importance of these reselling relationships has declined and software partnerships, as they are the focus of this study, have become more important. This development has been given even more impetus through the wide adoption of SOA principles in the industry. In the following quote Interviewee B4 comments on this development. Furthermore, Interviewee B6 adds another interesting side note to the development of the partner network. Essentially all companies in the IS development industry can be assumed to have their own partner network. Thus, the acquisition of various companies by Case Company B has also led to some new partnerships.

> If you take a historical look at it, the first partners that joined our network came from the areas of hardware or hardware services. Those have been the first real resellers in our community. However, especially during the last couple of years the number of software partners has grown enormously. That started roughly 15 years ago. No one talked about SOA back then. That has developed during the last five years, and it has been connected with large investments into the middleware of Case Company B in order to facilitate communication between a large number of applications. (...) Today we have a partner network with more than 10,000 companies - out of which most are software partners. This obviously includes many smaller, local partners. (Interviewee B4)

> We have also attracted, step by step, new partners simply through acquiring companies. We had selling partners for our infrastructure solutions. Then, as a next step, we have acquired [a company], and we have thus also acquired

> the partners that [this company] already had. So you cannot really say that we have built up these partners, we have simply acquired them. We have acquired [this company] and they already had a working partner model. As a next step we have acquired [another company]. Through this acquisition we also got new partners. (Interviewee B6)

Besides this general development of the partner relations of Case Company B, there is one other very important aspect in the history of its partner network. During the 1990s Case Company B deliberately decided to stop developing business applications and instead focused on developing infrastructure solutions. Case Company B considers everything to be an infrastructure solution that does not need to be specifically adapted to the customer context. This includes for example operating systems and databases, but also collaboration tools including e-mail and the like, network management systems, or even systems that support software development processes. As this decision dates back more than a decade, most interviewees could not give real evidence on the backgrounds of it. However, it nevertheless should be considered as *the* most influential decision in the history of IS development in Case Company B. This is illustrated by the following quotes of Interviewees B1 and B3. Also, Interviewee B5 gives his perspective on the decision.

> Roughly ten years ago there has been the very fundamental decision that Case Company B is no longer addressing business solutions. We have quit this field, we have stopped developments of business solutions, we have not sold applications or solutions any more. That has been a fundamental strategic decision. We have dissolved the organization and have decided that from now on the solutions are developed by partners. Consequently, we have a strong interest in working with those partners. (Interviewee B1)

> From my perspective, an even better decision has been that we do not develop any business applications any more. Case Company B does not have software for accounting or controlling. You will not get a software that can be used to manage a utility company. However, what we have is good services, consulting, and a great infrastructure. We consider ourselves as provider of everything that a customer needs in order to get his software running. (Interviewee B3)

> For my line of business I can say very well how it developed. During the early 1990s Case Company B has still developed applications. We have invested heavily in the development of applications for all different kinds of industries. Then, somewhen during the 1990s, we have noticed that the different markets are developing with an enormous pace and that we cannot cover all the diverse markets ourselves. (...) That's why we have decided at the end of the 1990s that we do not continue to develop business applications. We

> have sold everything in this context and have started to focus more on solution partners. For us, a solution partner is anyone who is either developing this type of software himself, or who is refining third party software for a customer. (Interviewee B5)

As it has already been implied in the quotes above, the interviewees in Case Company B consider this decision a positive one. However, this overarching strategic decision is highly influential for all other decisions concerning the partnerships in Case Company B. It therefore has to be kept in mind when reading the following case narrative. Wherever it is especially important, it is selectively highlighted. One of these passages where this decision becomes especially important is throughout the following discussion on Case Company B's reasons for participating in these inter-organizational IS development networks.

4.1.2.2 Reasons for Participating in the Network

In this section, the benefits that Case Company B sees in the participation in and even the fostering of such a network are discussed. Here, the approach that has already been applied for Case Company A is followed. Again, the three reasons that have been proposed on basis of the theoretical work in the second chapter are of prime importance for guiding the case analysis. As a first step of this analysis, Table 4.3 gives an overview of the number of relevant interview fragments in each of the interviews.

	"Innovation"	"Technology"	"Market"
Interviewee B1	2	3	3
Interviewee B2	1	1	0
Interviewee B3	2	1	3
Interviewee B4	1	2	3
Interviewee B5	0	1	2
Interviewee B6	1	0	6
Interviewee B7	0	1	5
Interviewee B8	1	1	2
Sum	8	10	24
Average	1,00	1,25	3,00

Table 4.3: Relevant Interview Fragments by Benefits: Case Company B.
Source: Own Assertion.

As this pure number of relevant fragments is in itself not yet considered to be highly meaningful, the subsequent discussion goes into more details. First, this is done individually for each of the categories. Then, in a second step, again inter-relations between these three categories are introduced on the basis of the interviews in Case Company B.

Innovation Benefits. The first category that is assumed to drive the partner relationships of Case Company B are innovation related benefits. Interestingly, innovation benefits do not seem to play such a prominent role in this case. However, the above mentioned fact that Case Company B has deliberately decided to discontinue its activities in the business application development domain due to the fast paced development of this industry indicates that innovation indeed plays an important, albeit implicit, role. The reason why these innovation aspects are not explicitly addressed by the interviewees can also be found in this strategic decision. Innovations of partners are de-coupled from those of Case Company B in a way that the partners innovate *on the basis of* the infrastructure that is provided by Case Company B. The following quote of Interviewee B1 very well illustrates this implicit innovativeness:

> It is the very clear goal of Case Company B's partner strategy to involve partners in such a way that they develop their own solutions based on our technology. (Interviewee B1)

While this implicit innovativeness has been recognizable in all interviews, innovativeness of partners has only rarely been explicitly mentioned as driving the partner network of Case Company B. Interviewee B6 mentions the flexibility of smaller, local partners as key for the inter-organizational network; Interviewee B8 has been the only one who explicitly mentioned innovativeness of smaller partners.

> Our partners are very flexible in reacting to unforeseen customer demands. They are very quick in deciding whether they want to fulfill these novel demands or not. Especially the successful partners are unbelievably quick in these decisions. So, it is important for us to understand how the customer demands change, and to flexibly support our partners in creating value for the customers. (Interviewee B6)

> I also strongly believe that this large network of small partners is the most important source of creative innovations. We have huge labs with thousands and thousands of researchers, that's one thing. But we also need very clever people that think about very specific problems. We have to nourish this. (Interviewee B8)

In this context the fact is also very important that Case Company B does not only consider other (for profit) organizations as sources of innovativeness. Other sources of innovation are actively involved in the partner network of Case Company B. Examples that have been explicitly mentioned by the interviewees in this case are universities and the open source community, which are also closely related.

> Universities are actually also among our partners. There are a lot of free thinkers in universities, and we as Case Company B would be foolish to ignore them. We are actively trying to involve universities into our partner network, in order to better understand what's actually happening in research. (Interviewee B3)

> There are solutions, and we have successfully done this, which are brought into the open source community. We have seen that we are not able to develop these solutions fast enough in order to turn them into breakthrough solutions. So we have transferred the whole project, the source code and everything, into the open source domain. We have won enormously through this move. One example is [a product of Case Company B]. We have seen that we simply cannot beat our competitors, simply because we have been too slow. So we had to involve others. After we have brought [the product] into the open source community there have been universities, other organizations, and so on that supported this solution. Suddenly this thing starts to exist totally detached from our organization. (Interviewee B1)

Thus, innovations do play an important role in the partner network of Case Company B, which considers itself to be more a facilitator for the innovativeness of others. The reasons why Case Company B considers this facilitator role as more promising than pursuing the innovations internally, are very close to those reasons that have been developed throughout the theoretical part of this work. Interviewee B3 comments on this as follows.

> Case Company B is listed on various stock exchanges. Our revenues and their development are under very, very tight external surveillance. A small start-up or a university are not subject to this kind of pressures and thus also less restricted in what they are doing. (Interviewee B3)

Another part of the innovation aspect is the need to bring innovative solutions to the customer. This has already been touched upon above in the quote of Interviewee B6 on the flexibility of partners. This fact is implicitly included in the facilitator role in which Case Company B sees itself. Interviewee B4 argues that this is exactly one of the main reasons, why Case Company B has decided to follow this model.

> The solutions are very specific and they need to be implemented and adpated very quickly. Assuming that a legislative change is happening, we as a solution provider would have to ensure that our system reflects this change as soon as the new law becomes effective. That is exactly where we say, that we don't want to stringently follow all this specific developments. There are specialists that can do that better than we do. (Interviewee B4)

Thus, there support has been for the different shades of the innovativeness proposition, smaller partners are in part able to recognize opportunities for innovations faster than Case Company B. They are also able to bring innovations faster to the customer. Subsequently, the other two proposed benefits are subsequently analyzed in a similar vein, in order to determine whether these are more dominant in the context Case Company B.

Technology Benefits. As it has been stated in Proposition T_H, the accessing of software components that either supplement or complement their own solutions portfolio has been assumed to be a key goal of Case Company B. This is very true, as Case Company B has deliberately decided to discontinue its own business application development. Thus, partnering with companies that supply these complementary functionalities is indeed not only a key benefit, but even a necessity for Case Company B.

> This strategy has been born out of the recognition that we will never be able to address the application needs of different industries in which we operate in such depth as specialized partners. Especially in the business application environment, the market leader usually has so much industry specific expertise that he can cover most of what his customers need. We, in contrast, sell solutions across all industries. So we cannot sustain this in-depth knowledge in all industries. So it is easier to develop solutions that address problems across industries. (Interviewee B4)

> The software products that Case Company B is developing are all infrastructure products. We do not develop business applications. The answer to the question why we involve partners clearly emerges from this statement. If we do not involve partners that develop business solutions on our platform, I do not have a viable platform. Our customers typically do not want to buy a platform. They want to buy a business application. The customer is buying a specific solution from one of our partners, and he is interested only marginally in the underlying technologies. He has an HR problem, an accounting problem, a controlling problem, or a material management problem that he needs to address. He does not have an infrastructure problem. (Interviewee B1)

> Our partners are depending on us because they need infrastructure to implement their business applications at their customers. And we are depending on our partners, because customers only rarely buy computers to heat their buildings. That is an ideal cooperation because we are complementary to each other. (Interviewee B8)

Thus, business applications that complement Case Company B's infrastructure solutions are in fact the type of software that makes partnering for Case Company B most attractive. As an interesting side note, Case Company A as a key supplier of these business applications is also the most important software partner of Case Company B. Interviewee B4 recognizes this aspect in the following quote.

> Since we are a large company specialized in providing infrastructure, we're lacking extensive business applications. This makes our strategy very transparent: Case Company B is cooperating with those software developers that have exactly this expertise on the upper application levels of the stack. Case

> Company A is one of the biggest application developers with whom we are cooperating. If we consider our partners in terms of revenues that we're generating through conjoint projects, Case Company A is a clear number one. Obviously there are thousands of other software developers that we have close cooperations with in order to fill this application layer. Some of them are also competitors of Case Company A. (Interviewee B4)

Bringing in partners' business applications that complement Case Company B's own solution portfolio has to be considered a necessity due to the decision not to develop any business applications. Furthermore, the interviewees also mentioned infrastructure solutions that are developed by partners at various instances. These infrastructure solutions are commonly those that Case Company B does not have in its portfolio. These solutions can therefore be considered as being hypothetically supplementary. However, as Case Company B is currently not offering a similar functionality, they indeed have to be considered as being complementary. Interviewees B1 and B7 mention this complementary aspect of infrastructure partnerships. Interviewee B3 goes even one step further in stating that solutions of Case Company B are actually competing with those developed by partners, thus hinting upon partners that are developing not only hypothetically, but real supplementary solutions.

> There are for sure those partners that supply solutions that are sitting on top of ours. However, there's also a smaller group of partners that complement our own portfolio. If I'm working in the database sector, and I do not possess very distinctive competencies in a specific niche, then I might partner with someone who is developing a solution that complements my own. Simply because I'm not complete in what I'm offering. (Interviewee B1)
>
> We're actively considering whether we have an opportunity to augment our portfolio with partner products. As part of this we're also considering the potential of this partner to generate cross-selling opportunities[11] for us. And we're actively developing our partners into this direction. (Interviewee B7)
>
> The relationship between our partners' solutions and our own? That's a clear competition. A positive competition. If we have our own solution in a specific area and we see that there's something better out there, we would sell the better solution. Simply because we want to win the project. Internal to external, that's a competitive situation. But that is deliberately so, that has been our intention. (Interviewee B3)

[11] The term *cross-selling* has been used in this interview to denote sales that are triggered by sales of a partner. Commonly, the term refers to sales that are triggered by one company selling other products or services to the same customer (Harding, 2002).

Thus, the dominating rationale behind Case Company B's partner selection is the complementarity of these partners' products. This complementarity is clearly given if the partner develops business applications. Also infrastructure components might be complementary and thus an attractive portfolio addition. However, even those companies that develop infrastructure components that are in direct competition to Case Company B's are not excluded from the partner network. Yet another aspect has been implicit in most quotes above and has become very obvious in the quote of Interviewee B7. Case Company B is cooperating with partners to actively push its own products into the market. This aspect is addressed subsequently in the discussion of the last benefit category: Market access.

Market Benefits. In the theoretical part of this work it has been argued that partners are used to gain access to a broader market. Indeed this proved to be the dominating reason why Case Company B is intensely partnering with smaller software vendors. As it has already been discussed above, tapping into innovations and thus integrating complementary or in part even supplementary solutions is key to the partnership network of Case Company B. However, this partnering is only seen as a means to the end of successful market cultivation. Furthermore, the pure addressing of markets is also not the final goal of Case Company B. Rather, the revenues generated on these markets are what Case Company B is aiming at. Again, as Case Company B is a for-profit organization, this should not come as a surprise.

> The intention that we have to integrate our partners is that we can place our own technologies on the market. (...) It has been a strategic decision to discontinue our engagement in this business application segment and to let partners develop these solutions. Consequently, partners do have a very, very prominent position in the software group. (Interviewee B1)

> Case Company B does not see the satisfaction of partners as an end in itself. It's not that we supply them with our technologies, so that they can just play around with them. Rather, we want those partners to generate customer revenues. (Interviewee B6)

> We cooperate on the basis of a conjoint business plan. Part of this plan is, which topics we should address conjointly so that the market accepts our cooperation. That is, what are the technologies and services that Case Company B can bring into the relationship and what are the solutions that a partner can bring into the relationship so that the market recognizes the added value of this partnership. (Interviewee B5)

The basic rationale behind this strong focus on market success can be found in the role of Case Company B as an infrastructure provider. The smaller complementing firms obviously have a strong incentive to successfully sell their solutions to customers. However,

if they are close partners of Case Company B, the likelihood is high that through the selling of their own solutions, they also implement the infrastructure of Case Company B at the customer. This has been described as inter-organizational cross-selling opportunities by Interviewee B7 above. And, this is also the reason, why Case Company B would sacrifice parts of its own system for a successful project. This has been implicitly assumed as a reason for accepting supplementary partner solutions above: Case Company B does put the highest emphasis on successfully fulfilling its customers' demands. If a customer requests a certain partner solution, Case Company B offers this solution, no matter whether Case Company B has an own solution addressing this functionality or not. Also, Case Company B supports its partners in their marketing activities for this reason. So, through their partner activities Case Company B is essentially generating revenue streams. In this context, there are two distinct sources of these revenues. First, direct revenues result from partners that are re-selling Case Company B's infrastructure. Second, influenced revenues result from a customer buying Case Company B's infrastructure because a partner recommended it.

> It is very important to recognize that we have two fields of interest when we're working with partners. The first is a partner is recognizing an infrastructure pain point at a customer; he then buys this infrastructure solution from us and sells it to the customer. That's the first source of revenues. The second one is a partner who is offering a specific solution to the customer, an e-mail system or whatever. This partner now has the opportunity to do this based on Case Company B's infrastructure, or on that of our competitors. Obviously we want this partner to do it on our infrastructure. (Interviewee B6)

The generation of revenues is therefore considered as the key rationale why Case Company B is fostering these IS development networks. Thus, it is also recognized that the success in partnering is key for the success of Case Company B. It is also recognized that this success in partnering cannot be achieved, if the development of the partner network is not continuously supported. Interviewee B3 illustrates this crucial time aspect with the reference to the durability of such a software infrastructure platform.

> Such infrastructure topics will be of more and more importance in the future. We have to educate our partners better with regard to our strategy, our offerings, our technology, so that these partners can be successful in the market. Whenever one of our competitors' platforms is installed somewhere, we're having a huge problem. Software-wise it takes eight to twelve years to exchange this infrastructure. The moment that thing is installed at a customer we're out of the deal. If you want to phrase it like this, the partner has failed. And that means that we have failed to support him, to train him, to educate him, to inform him, it's our fault. (Interviewee B3)

For Case Company B, the three theoretically developed categories of benefits have been found to be highly relevant for the decision of Case Company B to participate in and foster such a network. However, temporal dynamics between these three factors have been recognized in this context. Thus, in the following section the variance theoretical approach is abandoned and a process view is used to especially analyze these dynamics, and integrate the factors into a coherent picture.

4.1.2.3 Towards a Process View on Developing Networks

The fact that the above discussed three key benefit categories are closely inter-connected has already been implicitly included in many of the given quotes. Especially the decision that Case Company B is deliberately not offering any business application functionality has indicated that in order to achieve market success, partners' solutions are a key necessity. Thus, here again thes static (variance or type one process) view is not sufficient for explaining the partnerships Mohr (1982); Van de Ven (1992). Consequently, again a dynamic perspective is used in order to explain how these relationships change over time. Similar to Case Company A, the above discussed three motives were not found to be drivers for the this network formation, but rather events that triggered the transition between the stages in this developmental sequence. During the interviews, the partnership process of Case Company B has been commonly assumed to begin with the identification of a partner solution that is considered to be attractive for Case Company B. This screening process is already geared towards the final goal of revenue generation. However, as Interviewee B7 also mentions, revenue generation is considered to be a multi-dimensional concept for Case Company B. Consequently, partner selection is also based on multiple criteria.

> We're selecting partners on the basis of a market screening. We're closely analyzing the successful ISV solutions with regard to the potential that they have for our own systems. We also consider what industries are currently promising and screen who's active in this industry and whether we can partner with them in order to grow in this industry. (Interviewee B7)
>
> If we see an opportunity for growth, we'll recruit partners in this context. These partners are selected on the basis of their potential [to contribute to this growth]. This is a multi-dimensional approach. We consider the product that the partner has, we consider the customers of the partner, we consider the industry he's in, and we also consider geographical aspects. (Interviewee B7)

Thus, Case Company B is actively fostering partners wherever market potential is recognized. The fact that these partners are necessary for Case Company B's market success is thus evident. That the partners' solutions by definition have to be emerging from innovations as they are defined in this work is also recognized by Case Company B. Interviewee B8 phrased this as *maturity* component.

> The dominating characteristic [for successful partners] is market potential. Period. But there's also a maturity component to this issue. We have talked about software development so far and I have assumed that we're talking about existing applications. Obviously you can develop new applications. You can develop applications, from which we believe that they have a huge future market potential. They may contain patents or other rights that give us access to large markets in the future. (Interviewee B8)

Thus, this time component is also included in the partner considerations of Case Company B. This goes as far as to support the development of specific smaller partners that promise to have large market potential.

> It is an art to correctly assess the abilities of the partners. Also in a sense of what they can achieve and when they can achieve it. The big partners they have much more power. But the smaller ones, those with 20 or 30 people, they simply do not have the power to implement everything all at once. We have to guide them through the sequence of their activities. (Interviewee B5)

> We support our partners, we invest in our partners. That can be through skill development, through knowledge transfer, through support in development, and so on. In return our partners have to realize certain revenues with Case Company B's infrastructure platform. (Interviewee B1)

> We're analyzing to which degree it is justified to support this partner through whatever is necessary to motivate the partner's developing in such a way that we participate in the success of this partner. (Interviewee B8)

However, Case Company B is not only approaching partners. There are also those partners that are making this first step. Thus, either the partner is approaching Case Company B, or vice versa. Interviewee B4 is illustrating these two ways to integrate partners into Case Company B's network. These two approaches should, however, not be considered as being disjoined from each other, as the quote of Interviewee B5 shows.

> There are indeed two scenarios. Either we're approaching companies and ask them if they want to join our community. We're actively acquiring partners for our community. There is also the other case, that a software company is inquiring what we're offering in this context. If they consider our partner program attractive they join and through this become part of our community. (Interviewee B4)

> It might happen that a partner suddenly comes to our attention. We're using all types of information, customers, our sales force, other external parties to see whether there are companies that might be of interest for us. If this is the case, we are increasing our activities with this partner. It's not a static system, there's a high dynamic in this context. (Interviewee B5)

Thus, there are multiple ways how a company that has successfully developed an innovative solution can partner with Case Company B. The fact that these partnerships are essential for integrating the business applications which run on Case Company B's infrastructure has already been discussed above. This also includes the fact that these business applications are necessary for market success, not only of the partners, but also of Case Company B. So, the conjoint financial success is seen as the ideal situation of a partnership by Case Company B. This close interconnection is illustrated by the following two quotes from Interviewee B7.

> I have a thousand reasons why I'm talking to partners. The main one is that I see a certain market potential. This includes an ISV that has a great solution that I can integrate. If this is the case, for sure I will cooperate with this partner. (Interviewee B7)
>
> I always need to consider how I position myself in the market. This also includes the partner. I have to give the partner the opportunity to earn money. That's what he's expecting from us. (Interviewee B7)

However, despite the fact that such a successful relationship is seen as ideal by Case Company B that does not mean that this type of relationship continues infinitely. Two closely related aspects of this have already been implicitly mentioned. First, the inherent dynamics within the IS development industry are constantly changing the competitive landscape that Case Company B and its partners are operating in. As the quote of Interviewee B7 below indicates this dynamic might eventually result in the termination of a partner relationship. Furthermore, despite the fact that partners are important for conjointly addressing markets and that Case Company B is even supporting partners in order to be successful, this does not mean that there is no competition between Case Company B and its partners. Especially if a partner is developing infrastructure functionality, Case Company B actively considers whether partnering with this company is the optimal solution. Interviewee B1 makes this relationship very explicit.

> This might lead to a point where we don't need the partner any more. The partner is no longer useful for us, simply because he has developed in a different direction. He simply doesn't use our products any more. (...) It is for sure so, that partners develop into different directions. There are some that develop very well, some that stay on a constant level, and others that simply die away. (Interviewee B7)
>
> It's a question of what development costs I can afford. If I am able to address a certain segment in which a partner might already be well established? Do I have a chance to develop an equivalent or better functionality than this potential competitor or partner? This within a reasonable timeframe? These are very strategic considerations. (Interviewee B1)

These strategic considerations might in some cases lead to a decision to partner with some companies, in other cases the decision is to develop an own solution, still in others the decision is acquire the other company. The fact that the latter two options are also viable for Case Company B has been very well illustrated by Interviewee B3 in the following quote.

> Case Company B has acquired a three digit number of companies during the last year. This happens if we see that these companies are very, very good in a certain area. If we need a very specific functionality in a certain context we have two options. We can educate people especially for this functionality. This is very hard work and takes a long time. Or we're checking the markets if there is a company that fits well in this context that we can acquire. (Interviewee B3)

Thus, not all of Case Company B's partnerships are designed to last forever. In specific cases, mainly in the infrastructure domain, Case Company B has deliberately decided not to partner, but rather to compete with other companies. This competing might result in imitating the functionality or in an outright acquisition of the partner. In any case, the official partnership is terminated. Summing up the discussion, indeed innovations are a necessary pre-condition for a successful partnering of Case Company B and smaller software development organizations. Once this innovative solution has emerged, Case Company B has considerable interest to integrate this functionality with its own platform in order to ensure good performance. Once the solution is well integrated with Case Company B's platform further development of the relationship depends on the kind of functionality that the partner is offering. If it is a business application, the partnership continues as long as it is profitable for all partners. However, if the solution is considered to be part of the technical infrastructure, the functionality might be absorbed in some form or another. These relationships between the three developed benefit categories is illustrated in Figure 4.5

In this context it has to be mentioned that especially the decision of Case Company B not to develop any business applications is seen by its partners as an important aspect of consistency in the relationship. The fact that partners can act within a reliable, transparent, stable environment is considered an important pillar of Case Company B's partner network. As some of the interviewees argued, Case Company B today still benefits from this decision.

> The guaranteed openness towards our partners is one of the main reasons why Case Company B is not offering any business applications. If I am offering any business applications, I'm competing heavily with those partners that want to sell similar applications to our customers. We rather have those partners who offer solutions to do this on the basis of our standardized infrastructure, no matter in which direction they are developing. (Interviewee B6)

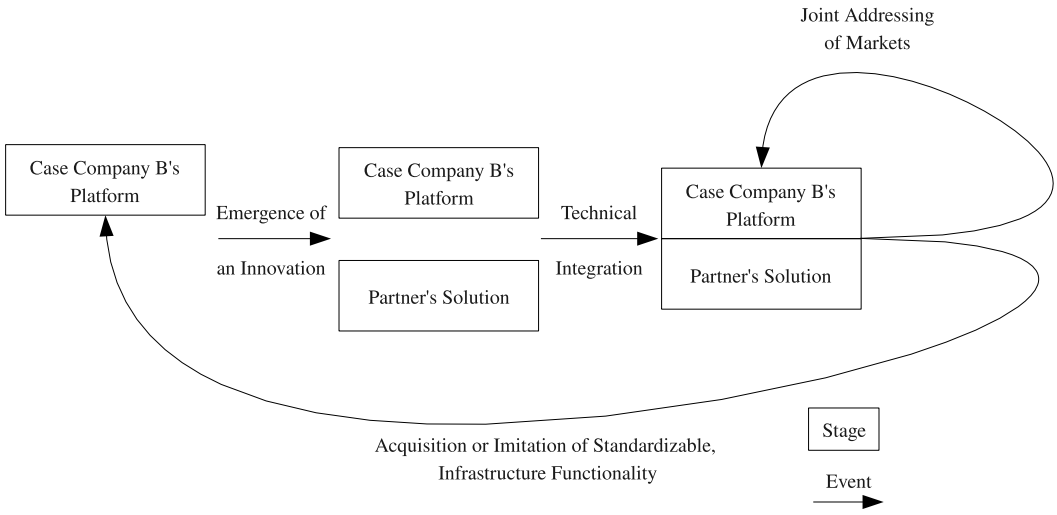

Figure 4.5: The Innovation Cycle in IS Development for Case Company B. Source: Own Illustration.

> Especially from an application developer's perspective, we recognize that these companies appreciate the fact that we are not competing with them. For sure they also appreciate that we're technology leader in many fields. But especially smaller companies pay close attention that their bigger partner does not squeeze them out of the market overnight. Other companies are infamous for not only acquiring smaller partner, but for simply developing a competing product and thus squeezing them out of the market. In order to prevent this, we have a very good understanding of the boundary of the functionalities we offer and we respect the core business of our partners. (Interviewee B4)
>
> The market appreciates the fact that Case Company B is deliberately avoiding the business application layer. We do not want to compete with software firms. That actually brings more and more members into our community. In this regard, the fundamental decision 15 years ago pays off today. You could argue that those who made this decision have been real visionaries. Or it has been developing in this direction by pure happenstance. In any way it is a great attractor that lets our partner community grow steadily. (Interviewee B4)

However, even when considering infrastructure solutions, the absorption of these functionalities is considered by no means as an automatism by Case Company B. Rather, the decision how to deal with those companies that are developing what is assumed to be an integral part of Case Company B's infrastructure is highly complex. One very important issue in this context are the idiosyncrasies of software development, which

make an acquisition difficult (see also Arndt and Dibbern, 2006a). These idiosyncrasies are very well illustrated by the following quote of Interviewee B1. Also the fact that one Case Company B is facing a multitude of smaller complementers is contributing its share to make the situation more complex. Interviewee B8 illustrated this one-to-many relationship very well.

> Software is for sure different than for example the automotive industry. If you acquire a company and are not successful in integrating the employees they will quit. Then the question is what is the actual benefit from this acquisition? Sure you have the intellectual property, you have the code that these employees have developed so far. But if you acquire a company with 20 employees and after one year these 20 employees have quit, then you're actually back to where you started from. (Interviewee B1)

> It is simply not true that we, as a global player, can beat the smaller companies. If you consider one small company, every one of the global players can beat one small company. Through acquisition or some other way. But if you consider the dynamics of the market, all global players have difficulties to beat one million small companies. Instead, the global players have to cooperate with the smaller companies in order to participate from their market development. (Interviewee B8)

This discussion has highlighted the relationships between the different categories of benefits that Case Company B derives from partnering with smaller software development firms. It has been argued that the three theoretically developed benefits are all highly relevant. However, all interact in a complex, cyclically dynamic pattern between innovation, technology, market success, and novel innovations. After this section has attempted to give an answer to the first research question of why Case Company B is extensively partnering, the following section resumes the second research question of how Case Company B manages its relationships to other network participants.

4.1.2.4 Management of the Network

In order to give an answer to the second research question, again three aspects have been developed on the basis of various theories. From this theoretical discussion it can be assumed that these three are of prime importance in the management of the network relationships. Table 4.4 shows again how often the interviewees in Case Company B have mentioned the three mechanisms in their interviews.

These numbers well support the propositions that all three aspects are of prime importance in the context of Case Company B. Thus, similar to the approach of the preceding section, the data collected in Case Company B is subsequently used to first address them individually. Then however, in the concluding part of this section the inter-dependencies between the three factors are again discussed and brought into the context.

	"Standardization"	"Monitoring"	"Personal Rel."
Interviewee B1	0	2	1
Interviewee B2	1	0	0
Interviewee B3	1	0	3
Interviewee B4	1	5	3
Interviewee B5	2	3	4
Interviewee B6	2	3	2
Interviewee B7	1	1	1
Interviewee B8	2	1	4
Sum	12	15	18
Average	1.50	1.88	2.25

Table 4.4: Relevant Interview Fragments by Management Mechanisms: Case Company B.
Source: Own Assertion.

Standardization. During the preceding discussion it has already been implicitly and explicitly argued that Case Company B very well recognizes the important role that standards play in an inter-organizational IS development context. Interviewee B6 for example mentioned open standards as key for allowing partners to flexibly integrate their solutions on the basis of Case Company B's infrastructure.

> If I have a standardized model I am open to go in very different directions. I can take a look at the markets and see what the customers actually want. Then I can determine how we can address these requirements together with our partners. (Interviewee B6)

Especially smaller companies and those that are not very experienced in the partner network of Case Company B heavily rely on these standardized technologies for their developments. In this context, again Service Oriented Architectures have been mentioned as being key for driving the industry towards a more standardized model. Interviewees B8 and B5 illustrate this through the following quotes.

> Companies with only ten employees rely heavily on our partner portal. They can download various development tools that we are offering there. They can test them, they can see what's good and what's bad. They can integrate their own solutions into what we're offering. That's done very frequently. (Interviewee B8)

> Of course we're talking to our partners about market trends. Especially in the context of integration of and communication with partner applications, SOA is a hot topic. The topic will be key to our success over the coming years and we're pushing this very much. We're helping our partners to get into these service oriented architectures. (Interviewee B5)

Also, Case Company B is not only recognizing the importance of using open standards, it is also actively trying to set these standards. Interviewee B4 heavily emphasizes this fact.

> We do not protect ourselves through the encapsulation of our network. Our experience has shown that, especially in IT with its high dynamics in interfaces and communication, such closed systems are not very long-lasting. Eventually, one component fails and then the entire system breaks down. It is much better to live up to this openness and to let others participate in the network, even if we cooperate with some of our competitors. I'm sure that we're different than others in this regard. We have opened many of our solutions for example into the open source community. There are standards set through this, and these standards are then the basis for all our further developments. In this regard we have progressed very far on the open-ended scale of standardization in the IT industry. (...) Many of our partners appreciate this approach and thank us through an intense cooperation. (Interviewee B4)

However, this reliance on standardization is not limited to using specific technologies. Case Company B is going beyond this, in that it considers standardization an integrated approach that is encompassing technologies, but also information flows between partners. Indeed, the access to standardized information is seen as an integral part of these relationships. This is illustrated in the quote of Interviewee B5. Going even beyond this, Interviewee B7 mentions a further integration of for example processes as part of this integrated approach in the following quote.

> We have a global portal for partners. The partners can register and thus become members. Through this membership they gain access to development information, for example early code. There are also different other kinds of relevant information, like the announcements of training and the like. Our partners are pro-actively supplied with information that is relevant for them. (Interviewee B5)

> There are also very simple aspects to this cooperation. The integration of standardized processes and even the standardization of entire business relations is a good example. I believe that this will be increasing in the future. I would even consider that as the quintessence of our relationships. Obviously

> this is also supported by technologies, such as collaboration tools that can be used by partners. (...) We are currently enforcing this through systems that our partners can access in a self-service fashion. They are actually integrating their processes with ours though these systems. (Interviewee B7)

Yet, even the use of standardized technologies and processes as management mechanism is - albeit highly important - not sufficient when it comes to more close partnering. Thus, this access to the web site and the self-service systems of Case Company B is only considered to be the first step in an ongoing process. As Interviewee B4 argues, subsequent steps include the application of more sophisticated management mechanisms, which are described in the following quote.

> I want to put it like this. On the very first step, which gives a partner access to standardized products and information, the relationship is not very tightly governed. I believe that every company is becoming a lot more formalized in the moment that it acts on the markets conjointly with third parties. In this case the reputation of Case Company B is at stake, so we significantly raise the bar. But I do not believe that we're much different than our competitors. We do, as our competitors, have very clear criteria what a partner is allowed to do and what not. (Interviewee B4)

These criteria of what a partner is allowed to do and what not leads over to the next proposed management mechanism, the increase in transparency in a relationship that is achieved through the monitoring of partners. This particular mechanism is discussed in the following in more detail.

Monitoring. Besides the above discussed access to standardized products and information, Case Company B is using other management mechanisms. Going beyond this very basic foundation in the relationship between Case Company B and its partners can be considered as Case Company B sees the underlying rationale to partner in the joint market success. However, when jointly addressing markets with a partner, Case Company B has a legitimate interest in gathering more knowledge about the partners. This distinction between simply accessing standardized products and information and the necessity to ex ante reduce uncertainty in order to go beyond this initial level is well described in the following quotes.

> The first step to become a member in our partner network is not very formal. Especially software developers usually start with this step. They have access to certain products, they can download them, experiment with them. Essentially this is a show case to become familiar with our technologies. The partner is not allowed to go to market with these products. The moment they want to go to market it is becoming a lot more formalized, up to very

> specific certifications. For this certification, the partners need to invest in education of their sales and technical skills because we want to ensure that everyone who is going to market with our products and solutions is sufficiently qualified for this. (Interviewee B4)

As it has been implicitly mentioned in these quotes, the certification of Case Company B in general addresses people's skills. There are various types of certifications - reaching from sales certification to technical ones. These certifications are furthermore differentiated according to different products that Case Company B has. In order to ensure that partners certify their employees, Case Company B even prescribes that certain certifications have to be obtained in order to receive incentives for certain projects. Another aspect of this certification of people's skills is the fact that the certification has to be renewed on a continuous basis to stay valid.

> In order to sell [a product of Case Company B] a partner needs a certain amount of qualified, certified employees in this context. Case Company B has to attest that these employees possess certain skills. Partners need sales certifications and technical certifications so that we can ensure that they are able to conduct a project from beginning to end. This is a clear quality criterion. In order to participate in our programs that provide incentives for this joint value creation, certain certification criteria have to be fulfilled. (Interviewee B6)

> Of course these certifications are not valid forever. You have to renew it in certain cycles. Through this, we keep the partners knowledge consistently high. (Interviewee B4)

However, besides this personal certification of partner organizations' employees, there is also a focus on the solutions of these partners. Here it is especially important whether a partner has successfully conducted one or more customer project(s). If this is the case this partner can specify this project as a reference show case. A reference project of this kind is considered to be an integral part of a successful partnership by Case Company B. This has been described by Interviewee B5.

> The partner has to show us a reference project. It does not need to be a public one, it can also be internal. We have to be able to check into this project and see some of its details. If we are satisfied with the reference, we offer more benefits, like conjoint marketing activities, the compilation of a brochure, or the like. It is a comprehensive set of activities that we provide to those of our partners who have qualified. (Interviewee B5)

These two aspects are the supporting pillars of Case Company B's monitoring activities. A partner has to show his quality through the fact that he has both considerably qualified (i.e. certified) employees and considerable customer references. Only if both

aspects are fulfilled, this partner is allowed to refer to the partnership with Case Company B, for example at its customers. However, Case Company B is also well aware of the shortcomings of this monitoring of partners. Especially the ex interim monitoring of a partner's success promises to be difficult. The reason for this can be seen in the two different types of revenue generation through partners. Thus, there are also considerable difficulties in truly assessing what constitutes a successful partner, and what an unsuccessful. Interviewee B4 very well describes the difficulties that Case Company B is facing.

> How can we measure the success of our partner activities? It is pretty easy wherever partners resell our products. The partner is buying our product, integrates it with his own solution, and resells the entire package. We're simply measuring the incoming orders from our partner community. But that's only one part of it. The second part is what we're calling "influenced revenues". These are revenues that are generated through a partner who is recommending our infrastructure, or through the fact that the solution of the partner is running exceptionally well on our infrastructure. This type of revenues is obviously much more difficult to measure, simply because there is no direct order through the partner involved. Ultimately the customer is buying our infrastructure independent of the partner. Nevertheless the work of the partner has been the trigger for this order. This is very difficult to measure. (Interviewee B4)

Thus, there is a need for even more sophisticated management mechanisms. This, because the monitoring of partners is so difficult. This also, because the monitoring is, despite the fact that Case Company B highlights its importance, only considered to be a potential indicator of the quality of a partner. The final decision of whether a company is becoming part of a certain project or not is always with the customer. This decision is obviously not always an entirely transparent and objective one. Case Company B also recognizes that more than standardization and monitoring contributes to this decision. Mostly, close personal ties are an integral part of this decision.

Relationship Building. Indeed, good relationships between Case Company B and its partners are considered as being of prime importance for the success of the entire partner network. It is also recognized that these good relationships between the organizations by necessity have to be based on close personal ties between the employees of the involved organizations. Thus, while the above discussed programmatic management mechanisms are for sure important, they always have to be accompanied by personal relationships between the involved individuals. This is very well illustrated by the two quotes below.

> Of course you have a second element. That is how the partnership is lived. You need people with a certain skillset. They need to understand how networks work, they need to understand the soft values that are the most important part of these relationships, they need certain character traits to fill such a relationship with live. (Interviewee B5)
>
> The entire partner network depends on personal relationships. If you walk out of this office, you'll see that our partners have offices right next to ours. We're renting out to partners not because we're in need of the money, but because we want the partner to be right here, right next to us. We want the partner to know that myself and other colleagues are walking around here and that the partner can approach us. We're trying to organize this networking right here in our offices. That's real people business. Especially in IT much is driven by trust, and that only works if you know each other. (Interviewee B6)

However, in the perception of Case Company B, this basing of cooperations on close personal ties also has a severe draw-back. In this context it has to be foremost ensured that these personal relationships do not lead to unequal treatment of different partners. Rather, all partners have to be treated equally in order to guarantee a successful partner network. This is indeed one of the fundamental pillars of the inter-organizational network around Case Company B, as the following two quotes illustrate.

> Our partner concept is first, to treat all partners fair and equal. That is all partners have the same rights if they have the same duties. Part of this concept is the web platform. This platform covers various aspects of a partnership: Development, sales, and a lot of other things. For all these areas we have different rules that are consistent over all partners. We have rules for joint marketing, rules for joint training efforts, rules for supporting our partners, and so on. (...) Every partnership has to be based on the same rules. (Interviewee B8)
>
> As I said, we have a partner charter, which is basically the constitution of all our partnerships. All the basic rules are formulated in this charter. We keep this very general, for example that we have to treat all partners equally, that we commit ourselves not to show any preferences for specific partners to our customers, etc. (Interviewee B4)

Thus, indeed personal ties are a core aspect of a functioning relationship between Case Company B and its partners. However, these personal ties have to be carefully managed in order to positively contribute to the overall network. This foremost, as they should not result in unequal treatment of different partners. Second, these personal relations have to be considered the most expensive management mechanism.

Thus, summing up the discussion on the individual management mechanisms, there is ample support for the co-existence of all three proposed mechanisms. Implicitly, there has also ample support for the perception that different partners are managed through different mechanisms. The main reason for this can be found in the fact that, as it has already been mentioned at various instances throughout the interviews, different management mechanisms come at different costs. Thus, the sheer number of the partners in the network makes a highly intense, dedicated personal treatment of all partners infeasible - even for a large organization like Case Company B. Thus, there have to be different levels in the partner network - as otherwise Case Company B would conflict with its own policy to treat partners with equal rights equally. Which these partner categories are, and how they can be reached is covered in the following discussion.

4.1.2.5 Developing Relationships between the Mechanisms

The constraint that equal treatment is only granted to the partners if their duties are equal is especially important with regard to the degree of utilization of the different proposed management mechanisms. In this context, Case Company B does not consider its partnering with others as a static event. Rather, it is considered to be a dynamic process, which is not only differentiated between the temporal stages of a partnership that has been discussed above. Also, the intensity of the partnership is subject to change. In this context, the accessing of standardized technologies - and also information - is only seen as a first step. This is achieved through signing up on the already mentioned partner web site. Partners can become *members* of this site and receive information about Case Company B's developments. This membership as the very first step is very unrestricted by Case Company B, it is even assumed that most of its competitors have also signed up here. However, as unrestricted as this access is, it is also limited. The following quotes show this very well.

> If we recruit partners it is the first step for them to become members of our network. This membership costs a little money, so there is some commitment to sign up. It's not a big sum, but especially for very small partners this is not done for no reason. Thus, these companies officially become partner of Case Company B. (Interviewee B6)
>
> As a member of this web site you're not a recognized business partner of Case Company B. You do not have any rights to use our name, to communicate this partnership to anyone in the market. I assume that every single one of our competitors is a member of this web site. (Interviewee B8)

In order to increase the intensity of the cooperation with Case Company B, partners first of all need to be successful in what they are doing. Further, these also have to be open towards a certain monitoring of their success. In this context, especially certified employees and customer projects have been mentioned as the only way to gain an

improved status in the partner network. This improved status is first of all a quality signal to the markets. Partners that reach this level have shown their quality, explicitly towards Case Company B but therefore also implicitly to the market. Furthermore, addressing the idea of equal rights for equal duties[12] that has been raised above, they also earn more rights in the cooperation, foremost the right to officially use the name of Case Company B in the market.

> You have an implicit quality insurance. This quality insurance is realized through the different levels that you have in our partner program. The basic level is being a member. Then there are different criteria in which a partner can score. He can certify employees, or he can show us his references. For both he receives a certain score. If a partner has reached a certain score, he is raised to the next level of partners, which also communicates some aspects of the quality of this partner. (Interviewee B6)

Reaching further levels in the relationship between Case Company B and its partners is achieved in a similar manner. Again, a partner receives points for certified employees and successfully complete customer projects. A certain number of points enable this company to reach a new partnership level. However, another important aspect of this next partnership level is that a certain score does not guarantee that a partner reaches this level. Rather, it is 'by invitation only'.

> We have defined these quality parameters and also evaluate the results. The last status is reached by a partner that collects even more points in a broader set of criteria. This gives customers an even better understanding of this partner's quality. (Interviewee B6)
>
> The highest level of partnership is by invitation only. We come to a very specific agreement in which we state that we want to cooperate more intense for certain reasons. We do have specific contracts for a well selected number of partners. That is very limited, we pick those partners very carefully, and we also cooperate for a longer time-frame. (Interviewee B5)

In an operational sense, the main difference between the middle layer of partnerships and this top layer is the increase in dedicated personal support. As the expenses of this dedicated personal support are significantly high, the number of partners in this category is limited in the above described fashion. This is especially important if one considers that large, global companies like Case Company B often do have thousands of partners worldwide. Personal attendance to each single one of them is therefore prohibitively expensive. This is also recognized by Case Company B, as the following quotes show.

[12] The duties in this context are for example to keep the certifications up-to-date.

> Depending on the status or the size of the partner, they have a designated attendant in Case Company B. There are other partners that are satisfied with the access of the web site that's open for the partner network. They retrieve their information without ever receiving personal support. (Interviewee B4)
>
> We have designed our partner concept in such a way that most of our partners receive that kind of and amount of support that can be justified. The very small partners are also highly important for us, but I simply cannot offer resources to an organization with five or ten employees that surpasses this organizations revenues. I cannot invest two millions to realize a project that's worth 200,000 Euro. We're doing this with a very distinct sense of proportion, especially for the thousands of partners with whom we do not interact on a daily basis. For these partners we have our web site. We will not send someone to each of these partners to discuss things with this partner for an entire day. This day costs us 1,000 Euro. If we have 100,000 partners, that's just not possible. (Interviewee B8)
>
> A lot is covered over personal relationships. However, obviously we're trying, especially for the smaller partners, to do a lot on the phone. We simply cannot afford to visit all of them personally. (Interviewee B7)

Thus, the entire partner network can be classified into a three level pyramid. The bottom layer consists of the simple *members* of the network. They receive standardized information and have access to parts of Case Company B's technology. The next level can be reached through certification of employees and successful customer projects. These companies are officially recognized as partners of Case Company B. They have the right to use this official partner status in the markets and also receive additional support, like joint marketing and sales events or training. The final stage of the pyramid consists of those partners that have an exceptional track record with Case Company B. These partners receive additional support in the above mentioned categories and also a more intense, personally dedicated support. The degree of personal support across the three stages of the pyramid is briefly described in the following quote. The entire pyramid is also sketched in Figure 4.6.

> We have a three staged concept. For the topmost layer we have direct contacts just for this partner. In the middle we have contacts that support roughly twenty to thirty partners in the region. On the very bottom we have partners that work with us from time to time but they are not in our direct focus. (Interviewee B3)

However, it also has to be stated that this three staged pyramid is not a static concept. There are again considerable dynamics between the levels of the pyramid. Also, the type of management mechanism applied predominantly at the three stages is not fixed. Well founded exceptions exist. This is illustrated below.

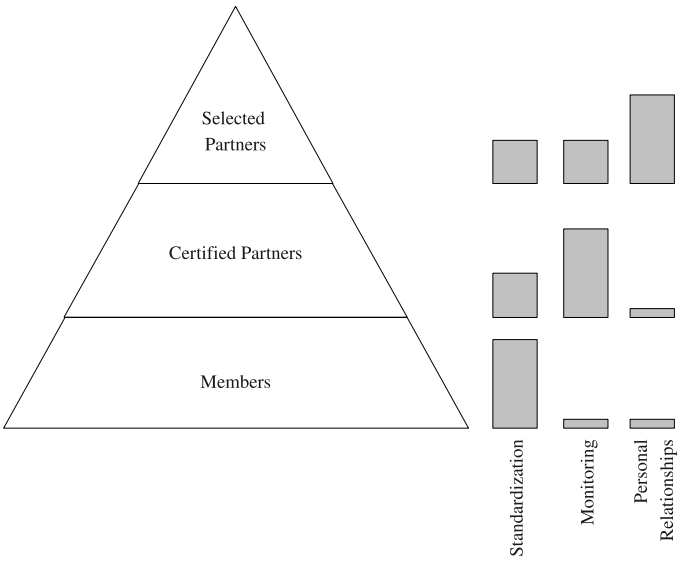

Figure 4.6: The IS Development Partner Pyramid for Case Company B.
Source: Own Illustration.

> In the end it's about our investments. We invest into specific target groups, but obviously not only into these. We have a group of partners in the very top level of the pyramid. We have a close, dedicated support for these, they are important to us, we want to develop the relationship with them. However, there are also partners in this middle segment that we want to develop into top-tier partners. Obviously this is a small part of the entire group. However, all of these middle segment partners do have access to a general kind of support. Sure, they can also get in touch with us, they can also use the programs that we provide. (Interviewee B5)

Summing up the discussion on the management of the network relationships by Case Company B, it can be stated that indeed access to standardized technology and information on the lowest level is the foundation of all partner activities. One the one hand this is intended to ensure that all partners are treated equally. On the other hand it is seen as a first step in a partnership process especially for smaller and younger companies. Once the ongoing quality of such a partner has been shown through certifications and successful projects, this partner reaches a certified level. Obviously through this process, Case Company B has more knowledge about this partner, but the partner in return has also considerable more rights. Finally, if the relationship is continuously highly successful the partner might be invited by Case Company B to join the highest partner category.

The distinct feature of this partnership level is the close personal interaction with the partners. As this management mechanism is also the most expensive one, the number of partners on this level is highly limited.

4.1.2.6 Matching Benefits and Management Mechanisms

Addressing both the benefits that Case Company B derives from cooperating with the partners and the management of the relationships to these partners is indeed considered to be fruitful by the interviewees. Interviewee B5 indicates in the following quote that both aspects are highly important for the success of the overall partner network.

> For the success as the sum of all our activities we have two clear indicators. The success of our partnerships is clearly depending on two aspects: Did we choose the right partners and did we manage them the right way? (Interviewee B5)

After addressing the two issues largely detached from each other in the two previous sections, the present section focuses on the integration of the two. As it has already been discussed in the two preceding sections, indeed Case Company B considers the relationship to a partner to be a dynamic process. These dynamics can be found on the one hand in a temporal dimension. Here a partner first develops an innovative solution; then he integrates this functionality with the infrastructure of Case Company B; finally the partners go to market conjointly with Case Company B. On the other hand the partnership is also a dynamic process with regard to the intensity of the relationship. Here, the first step is becoming a member of Case Company B's partner network. This step is relatively unrestricted. Then, through the certification of employees and through successful customer reference projects, a partner can advance to a higher level of partnership. Finally, if even more employees are certified, if more customer projects are successfully completed, and if this partner is invited, he might reach the highest level of the relationship. Characteristic of this highest level is the intense personal support by Case Company B. This two-dimensional process has already been identically described for Case Company A. It is illustrated in Figure 4.3.

In this process, the final goal of Case Company B is the successful market cultivation conjointly with a partner. As shown in Figure 4.3 there are essentially three ways how Case Company B can address markets conjointly with partners. Staying on the bottommost level of the matrix, the market cultivation could actually not be a joint one. Rather, the partner and Case Company B could address customers completely independent of each other. That this type of 'partnership' exists has been mentioned above in the context of the two types of revenues generated by partners. However, it has also been noted that this type of partnership is not considered ideal by Case Company B. This simply because there is much tentativeness in this type of relationship. Consequently,

Case Company B has deliberately reduced the entry barriers to their partner network with the introduction of the member status. Through this, more transparency in terms of who is partnering with what solution is induced in the network.

However, this does not indicate that the member partners necessarily have to leave the bottom-most layer of the matrix. There still is not necessarily any certification involved at this stage. Partners can access standardized technologies, information, etc. in order to generate successful customer projects. This almost detached market access is considered as the optimal process of joint market success. The partner is independently identifying and addressing market opportunities, based on existing technologies but without individual input from Case Company B. This would be the optimal case, which is following the bottom-most path to *isolated* market development in Figure 4.3. Interviewee B6 describes this ideal case in the following quote.

> We determine the attractiveness of a partner predominantly by the partner's ability to independently identify and close a deal. That's the most important criterion for a partner. We want to have partners that use the technology, the marketing, the sales support, that we provide them with. But we want a partner who can also work on the actual project independent from us. A partner that is identifying opportunities that are interesting for him, where he can close a deal, and where we can also sell our technologies and services is the optimal case. (...) We're a coach who provides a ball, but the players have to play alone, rather than a coach who is also playing in the game. (Interviewee B6)

However, as the discussion above has also shown, this situation cannot be assumed to be a realistic scenario. Rather, especially during the first projects, the partner needs to be supported by Case Company B in order to push this partner into the right direction. Thus, Case Company B is actively supporting partners in order for them to reach an advanced status. This has been described by Interviewee B7. The main benefit of this advanced status is that Case Company B can rightfully attest the quality of this partner. However, as this includes considerable risk for Case Company B, this step is usually preceded by a concise monitoring of the partner, first through certifying its employees and second through the necessity of a customer reference. This situation can best be described as *affiliated* market development on the middle layer of the matrix in Figure 4.3. It has been described by Interviewee B6 in the following quote.

> Well, the life cycle of a partner essentially starts in the moment that this partner is becoming a member of our network. With time, this partnership will grow. However, in the beginning we are well aware that the partner is unable to possess all the competencies that he needs to sell his and our products. We support this partner accordingly. Over time we expect this partner to educate his people and to reach a position from where he can perform all of these services himself. (Interviewee B7)

> The optimal case would be a system that is based solely on programmatic routines. In the ideal case that I have sketched above, where a partner is completely autonomous in his business, there would be no one involved from Case Company B. (...) But the reality is simply different, the market conditions are different, the complexities are more intense, so you cannot govern this solely through these programmatic routines. Especially those partners that have shown their quality through their partner status simply have a higher relevance for Case Company B, and they are also supported differently. (Interviewee B6)

Thus, the middle layer of the partner matrix is characterized by the fact that Case Company B implicitly makes a statement of this partner's quality through the certification. The partner then has the opportunity to actively promote his partner status in the market. Finally, there are also those partners that Case Company B considers to be of prime importance. These are invited to join the top-most level of the partnership matrix. This includes close personal interactions between employees of the partner and Case Company B. This type of partnering is very well illustrated by the relationship that Case Company B and Case Company A have. As it has been mentioned, both companies are among the most important partners of each other. This relationship therefore very well illustrates the differences in magnitude of support that such a highly important partner receives in comparison to the lower levels of the partner matrix described above.

> Imagine a new product of Case Company A would be released. Customers use this new product in a realistic setting and the response times go up from accepted sub-seconds to unacceptable hours. That's happening in reality. Simply because interfaces are not used correctly, because the fine-tuning has not been sufficient. Therefore, there are software engineers of Case Company A that are sitting in our labs and cooperating with our engineers to ensure that the way software is developed at Case Company A fits with our own developments. (Interviewee B8)

> Case Company A is our biggest partner. Therefore we do have a huge number of our own employees that are dedicated only to this relationship. Only here in Germany we have roughly 200 employees in this context. That's not just alliance management but also software engineers that adapt and test the inter-operability of our products. That is indeed a relatively large group. (Interviewee B4)

However, as it has been touched upon, this type of long-lasting relationship is only feasible with partners that are developing business applications. These are consequently also those that are most likely to advance to the top-most partner category. Those that are developing infrastructure solutions are less likely to be of that high importance for Case Company B. Thus, their relationship to Case Company B is probably developing

either along the middle, or even along the lowest level in the matrix. For these types of partners, being acquired is also definitely a viable option for Case Company B. At least if the functionality is attractive. However, this aspect is limited by the fact that Case Company B has a self-restraint not to perform hostile take-overs of certified partners. Once a company has established itself as a successful partner, Case Company B is attempting not to disturb this relationship. This is illustrated by the following quote.

> The company that gets acquired is at that point in time no partner. We do not acquire our partners. We scan the market and if we recognize a company that is offering a solution that we consider complementary to our platform we might acquire this company. That has happened in the past. If a solution has become relevant for our customers we have in some cases acquired the company that has been developing this solution. Mostly these have been smaller companies. We have also acquired competitors, which have been bigger deals. (Interviewee B1)

The transition between partner cycles is also illustrated in Figure 4.7. In this figure, suppliers of infrastructure solutions are developing on the middle or the lower levels. In case that they are actually not a certified partner, either an acquisition or imitating the functionality as it has been described above is attractive for Case Company B. If this happens, the cyclical partner process starts anew. Similarly, partners that develop business applications are also expected to innovate their solution. However, as it has been described in the preceding section, the functionality they provide is not absorbed into the platform of Case Company B. Rather, if they lose the innovation race in their (sub-)industry they might be acquired or imitated by competitors.

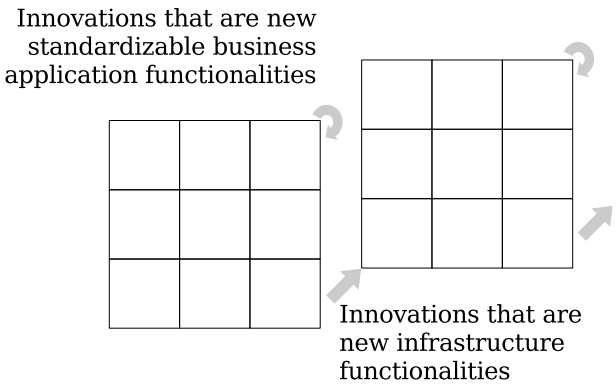

Figure 4.7: Cyclical IS Development Relationships for Case Company B.
Source: Own Illustration.

This closes the second case narrative. In this company, the theoretically proposed aspects have been found to be of high relevance in this organization. Most aspects have been highly similar in Case Company A and B, thus, after this second hub case narrative it becomes obvious that the findings of Case Company A cannot be considered unique. Rather, there seem to be consistent patterns between the two hub cases. Also, there are explanations for the differences between the two cases. Highlighting these is the topic of the following cross-case analysis.

4.1.3 Cross-Case Analysis

The goal of this section, as it has been described in the brief introduction to this chapter, is to explore the similarities as well as the differences of the two hub cases in order to develop truly generalizable findings of the role of this type of organization in an IS development network. Many similarities between the cases have indeed become obvious throughout the two preceding case narratives. This has also resulted in the fact that many of the figures that have been used to clarify the process of the development of such a partnership, both over time and through increasing intensity, vary only marginally between the two cases. Nevertheless subtle differences exist between the two companies both in how they benefit from their network and in how they manage it. Both aspects are subsequently discussed.

4.1.3.1 Similarities and Differences in Benefits

In fact both hub organizations follow close to the same process in developing their partners from an innovation over the technical integration towards joint market success. This is very well illustrated in Figures 4.1 and 4.5, which are close to identical. However, in these figures also a subtle difference between the two companies can be found. They differ only with regard to what kind of functionality leads to a prosperous, long-lasting relationship and what functionality puts a partner at the risk of being acquired or imitated. In a nutshell, Case Company A considers infrastructure providers as *ideal* partners, while Case Company B focuses on providers of standardizable business applications as *ideal* partners. The rationale behind this decision is clearly connected to what both companies consider as their core business. As it has also become obvious throughout the discussion on the cases, this is business applications for Case Company A and infrastructure solutions for Case Company B. So, both hub organizations focus their efforts on those partners that supply *complementary* products. The proposition that has been brought forward in the theoretical part, that also those partners that supply *supplementary* products are in the focus of the hub companies is therefore clearly not supported by the empirical data. This is illustrated in the generalized model of Figures 4.1 and 4.5, which is shown in Figure 4.8.

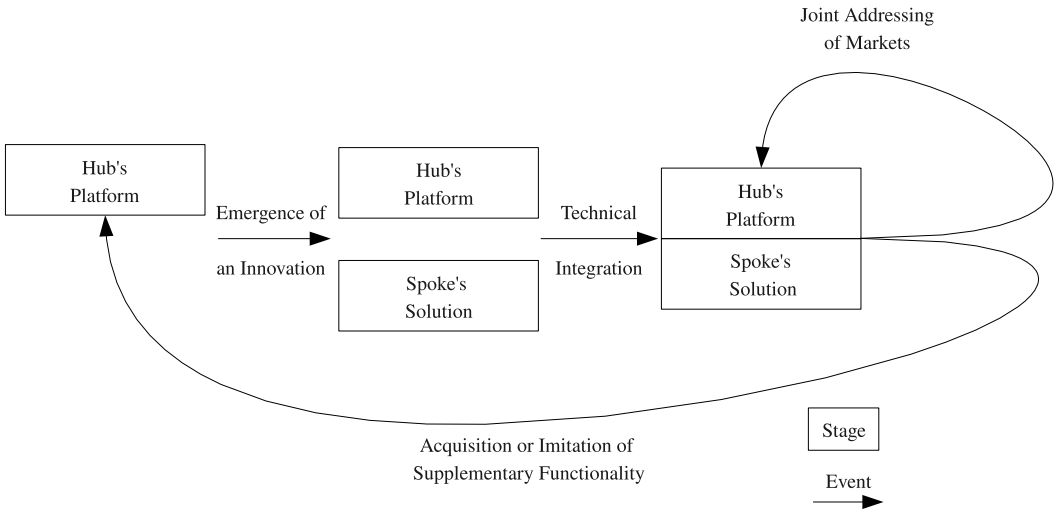

Figure 4.8: The Generalized Innovation Cycle in IS Development.
Source: Own Illustration.

An exception to this rule is whenever the hub companies consider a supplementary solution to be essential for market or even project success. If customers demand the use of a specific third party solution that is considered to be supplementary to their core offerings, both companies are willing to use this component. However, as it has been emphasized by both companies, this is mostly considered to be a temporal solution. Both hub organizations are more than willing to integrate not only these successful solutions, but also the entire companies that developed them into their own portfolio. This idea is also well addressed in the fourth *principle of architectural competition* as it is asserted by (Morris and Ferguson, 1993, p. 92): "General-purpose architecture absorbs special-purpose solutions." This fact is illustrated by re-iterating the following two quotes on this topic.

> These might be functionalities that initially have been part of a niche, but which are generalizable, which are getting on our radar screen because a lot of customers ask us to include them into our system. Then this niche partner has to recognize that his solution is becoming a commodity. (Interviewee A12)

> Case Company B has acquired a three digit number of companies during the last year. This happens if we see that these companies are very, very good in a certain area. If we need a very specific functionality in a certain context we have two options. We can educate people especially for this functionality. This is very hard work and takes a long time. Or we're checking the markets if there is a company that fits well in this context that we can acquire. (Interviewee B3)

An interesting theoretical viewpoint on this topic is provided by Bresnahan (1998) and his discussion of the horizontally layered computer industry that has been illustrated in Figure 2.4. As he argues, the key misconception of the horizontally layered model is that it allows for *more* competition. As he phrased it, "several of these 'competitive' horizontal layers have very concentrated structures, typically suggesting a dominant-firm and fringe model[13]" (Bresnahan, 1998, p. 4). In order to illustrate the concept, the general idea of a horizontally layered computer industry is applied especially to the enterprise IS industry in Figure 4.9.

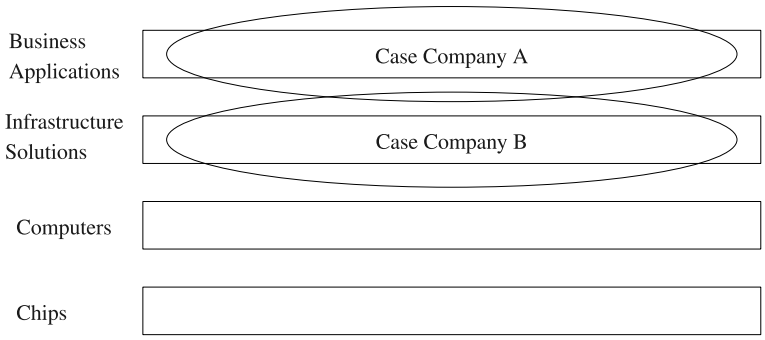

Figure 4.9: The Horizontally Layered IS Industry.
Source: Based on Grove (1996).

In this figure, the slightly overlapping oval for Case Companies A and B also illustrate the fact that both indeed have many touch points, so that besides being complementary to each other there is also considerable competition between the two. This relationship is a typical example of co-opetition (e.g. Nalebuff and Brandenburger, 1997), which is also recognized by the interviewees in both companies.

> Taking a look at our partner network, we also have very large partners. Like Case Company B. They are also a big software developer that is providing infrastructure functionalities. (Interviewee A12)

> There are rarely software companies that we consider solely as competitors. A typical example is Case Company A. Case Company A is by far our biggest software partner worldwide. We need Case Company A because they provide essential functionalities for our platform. In other areas we're fiercely competing with Case Company A. That's a typical co-opetition. (Interviewee B3)

This competition in the relationship between two companies in different layers of the horizontally structured IS industry can also very well explain the differences in partner selection. This perception is based on two of the "strategies deployed by firms in one

[13] I.e. a hub-and-spoke model.

layer against firms in another layer" of the industry stack that have been proposed by Bresnahan (1998, p. 15). First, hub organizations are supposed to try to include the important complementing functionalities within their own solution portfolios and thus making their portfolio an important bottleneck in the stack. Second, they are supposed to support different partners on the adjacent level in order to make the partners' solutions more a commodity and thus less of a bottleneck[14]. This very well describes the approach of the hubs to consider partnerships in business functionalities as temporal and those in infrastructure functionalities as permanent (Case Company A) or vice versa (Case Company B).

4.1.3.2 Similarities and Differences in Management Mechanisms

Similar to the discussion on differences in benefits, the general structure of the management mechanisms employed by both hub cases is very similar. However, here also subtle differences exist, especially in the lower levels of the partner pyramid. Both companies have classified their partners into three distinct sub-categories. On the top-most level are those partners that the hub organizations have a long-lasting track record with, which are of prime importance with regard to the revenues that they generate for the hubs, and which consequently do have a very intense relationship with the hubs. As it has been discussed in the individual case narratives, this intense relationship goes even as far as having engineers conjointly working on development projects.

The middle layer of both networks consists of those companies that have proven their ability to successfully work with the hubs. In both cases this involves a certification of some kind - either the product of the partner, its employees, or both. While these partners indeed contribute their share to the revenues of the hub organizations, they are not considered to be that critical. Thus, the dedicated personal support that they receive is a lot less distinct in comparison with the top-most category. Up to this point, both partner networks have been close to carbon copies of each other. However, for the middle and the bottom part of the network subtle differences exists.

For the middle part, the difference is one of certification. Becoming a certified partner of Case Company A requires only the technically successful interaction between the partner solution and the hub's platform. In contrast becoming a certified partner of Case Company B requires not only certified employees, but also a successful customer reference project. Through this higher entry barrier, Case Company B seems to be able to retrieve more knowledge about their partners than Case Company A. Thus, the certification is indeed not only a declaration of the technical inter-operability of the solutions, but also an, albeit limited, assessment of the partners' quality. Especially

[14] Please note in this context the very close connection to the resource dependency theory, in which power of an organization "derives from its discretionary control over resources needed by that other and the other's dependence on the resource and lack of countervailing resources or access to alternative sources" (Pfeffer and Salancik, 1978, p. 53).

with regard to the fact that such a certification is considered especially important for customers, this more sophisticated quality assessment seems to better meet the demands of such a certification.

However, while getting certified by the hub is more difficult for partners of Case Company B, the initial access to the partner network seems to be easier for them. Becoming a partner of Case Company B starts with a simple signing up on the company's web site. Despite the fact that this simply signing up does not give such a 'partner' any rights except accessing certain technology and information it nevertheless *binds* the partner to this specific hub organization. These companies can utilize the technologies that Case Company B is providing them without extensive investments, both financial and other. Thus, they are likely to rely on exactly these technologies, to educate their employees in it, to use it for their customer projects. Through this selection of a hub platform and the subsequent investments in it, Case Company B is able to initiate a positive feedback loop that has been discussed as key requirement for network goods in Section 2.1.1.3. In this context of two or more companies struggling for dominance in a certain market it is a well tested strategy to develop a competing standard, which are incompliant with that of the competitor. The result of this kind of development is labeled *standard war* (Shapiro and Varian, 1999a). Partners are thus required to select one of the multiple standards. Once they have chosen their standard, switching to a different one results in high costs - the partner is *locked in* (Shapiro and Varian, 1999a).

Another aspect of this locking-in of partners is the fact that, as it has been discussed, only the cooperations with some of these partners are promising to yield significant revenue improvements for the hub organizations. This viewpoint is also supported by the perception of Dyer and Singh (1998) that *partner scarcity* is a key to sustaining competitive advantages that originate in network relationships. Thus, assuming that, first, only a very limited number of the small, innovative companies that want to participate in the partner network of the hubs are those that have significant revenue potential, and second, that it is a priori not known which of the entire group these are, it is the consequent decision to integrate as many of those small partners as possible in the network. This especially as the lowest level of this partner pyramid is relying solely on standardized technology and information dissemination mechanisms. It is thus not involving large investments to add additional partners to this layer. This is illustrated by the fact that in Figure 4.6 the lowest level is bordered by a solid line, which indicates that Case Company B considers these partners as integral to their partner network. In contrast, in Figure 4.2, the lowest level is bordered by a dotted line, which denotes the opposite. Thus, through its open partnership (member) program, Case Company B seems to be better able to achieve this goal of easy, hassle-free integration of small companies into the partner network.

As it has been mentioned, these subtle differences in both the benefits of the partner network and its management are negligible in comparison with the similarities of the cases. Thus, indeed the denotation as *literal* replication in the sense of Yin (2003) has been justified. First, the general model of the partnership process from the hubs' per-

spective, as it has been illustrated in Figure 4.8, is indeed identical for both companies. It only differs with regard to which layer in their industry these companies consider their *home turf*. Similarly, the discussion of the three-tiered partnership pyramid has also been almost identical. Differences exist on the lower levels, but these are only marginal. Consequently, also the entire partnership process matrix, which has been developed as an integration of the two discussed perspectives, is also very similar.

Thus, the following section turns towards the second perspective of this work - that of the smaller spoke partners. Here again, first individual case analyses are conducted with eight smaller partners of Case Company A. These eight individual case narratives are then integrated into a cross-case analysis of the spokes. After that, as the last step of the empirical data analysis, both hub and spoke perspectives are integrated into a comprehensive view on the entire network in the last part of this chapter.

4.2 Spoke Cases Analyses

Similar to the preceding discussion of the two hub cases, the following sections on the spoke cases are sub-divided into three parts. The first part of each case narrative gives a brief description of the developed solution of each of the case companies. Then, the company itself is briefly described. This part includes aspects like the history and the size of the company. After this, the relationship of the company in Case Company A's IS development network is described. In the second part of each case narrative, the reasons for participating in this IS development network are discussed in the light of the theoretical propositions that have been developed in Chapter 2. The final part of each case narrative then covers the second research objective to analyze how these companies manage their relationship in the network. Again, this discussion is largely based on the three theoretically developed propositions. Also for the spokes, often more relevant interview fragments have been identified than have been used in the case narrative. However, for many of the spoke case only one interview has been conducted. So, the information that would be contained in an analysis of the number of relevant interview fragments is even more limited than for the hub companies. Therefore, this discussion is postponed until the cross-case analysis in Section 4.2.9, where an aggregated analysis of all the spokes is conducted.

4.2.1 Case Company C

Case Company Description. Case Company C develops interfaces through which various machines can be connected to the system of Case Company A. Customers of Case Company C are for example companies that are running vending machines. With the solution of Case Company C, these customers can automatically feed business data - for example the amount of sold goods - into their business application systems, if they have been developed by Case Company A. The focus of this company is especially on large enterprises, as the necessary expenses of integrating the vending machines into the

software system do not pay off for smaller companies that are running only a couple of vending machines. Furthermore, these smaller enterprises are usually not (yet) customers of Case Company A, and thus also not potential customers of Case Company C:

> If you are acting in a line of business as ours, vending machines, you have essentially two types of customers. You have the small ones, which are running three, five, or even twenty machines. And you have the large ones, which are running up to 100,000 machines. If you have a company that has the goal to develop interfaces for these customers for Case Company A's system, you know very well that the small ones are not your target. Someone who is running 20, or even 200, machines simply does not use a system of Case Company A. (Interviewee C1)

Parallel to this line of business, Case Company C has also customers from the energy sector. Here especially the solution of the company if feeding data from, for example, wind energy plants into the systems of Case Company A. Similar to the vending machine business, the data that is transferred through the solution of Case Company C is not primarily technical. Rather, business related data, for example the total amount of generated power, is collected. A new project of Case Company C is furthermore addressing the inter-connection of intelligent refrigerators with the system of Case Company A in a similar fashion.

Most of the developed solutions of Case Company C are standardized and not subject to significant changes between customers. For innovative projects, like the intelligent refrigerators, some new developments are initiated. Yet these new developments are based to a large extent on existing solutions. In addition to the development of interfaces, Case Company C also offers consulting services in related fields. However, this consulting represents only a small fraction of the overall business volume of Case Company C.

Case Company C has been founded in 2005 as a publicly held company. Currently the company has offices at three locations and is employing 15 people. Out of these 15 employees more than 80 percent are software developers. The only interview in this case has been conducted with the founder and CEO of the company.

As the solution of Case Company C is an interface that integrates into the systems of Case Company A, it comes as no surprise that the relationship between the two organizations is one of the most important pillars for Case Company C's business. Especially noteworthy is the fact that this relationship has been established even before Case Company C has been founded. The interviewee comments on this with the following words:

> Basically the relationship with Case Company A has been lasting for a long time. It did not emerge with the founding of Case Company C. Many of our employees - including me - had relationships with Case Company A when they were working in their former jobs. For Case Company C these relationships even intensified. We have been very fast with the development of our

> interfaces and among the very things in this context has been the certification by Case Company A. We became partners very early on. (Interviewee C1)

What has been described by the interview partner as a very natural process is now further analyzed according to the two research questions. First, what have been the strategic reasons why Case Company C entered into this relationship? Second, how does the company manage this relationship?

Reasons for Participating in the Network. It has been the first proposition that small software vendors, like Case Company C, participate in inter-organizational networks of large hubs because they have the opportunity to gain access to the architectural innovativeness of these large hubs. For this proposition no evidence could be found in Case Company C. The only instance where the interviewee talked about architectural innovativeness has been a discussion on SOA. However, as the following quote very well shows, this 'architectural innovation' is not considered a key reason for participating in the network:

> Currently we are in a project that is intensely using these Service Oriented Architectures. However, I do have a very pragmatic view on this. For me, this is old wine in new skins. I have not yet discovered the underlying differences to object oriented programming. I mean, the real differences for a real user. If you have written your code in a structured fashion it already has been re-usable and modular before the emergence of SOA. If you are writing bad code today, SOA cannot turn that into good code. I'm having a bad feeling with this. Okay, this is currently the hype topic. You can ask whoever you want to, everyone is talking about SOA. In this context we're to some extent also on this bandwagon. However, I don't think that it has any significant impact on our strategic partnership. This partnership did not change a bit through SOA. (Interviewee C1)

While architectural innovativeness is not considered a driver for participating in the network by Case Company C, this cannot be asserted with absolute certainty for all kinds of innovations. Especially the relationship to the R&D department of Case Company A has been mentioned by interviewee C1 as important for the relationship. In contrast to architectural innovativeness, assessing the existing technology base of the hub - the second proposition - is considered as being an important issue in the relationship with Case Company A. Here especially the in-depth knowledge of Case Company A's systems are perceived to be imperative for the partnership. However, Interviewee C1 also gives a cautionary note, that indeed this access to technology should not be considered as a differentiating factor for partner in comparison to those who are not partners.

> About 80 - 90 percent of our employees are software developers. These are primarily concerned with the integration to Case Company A's system. Thus, we also have people with in-depth knowledge how this system is working. They know how to turn all the 27 million adjusting screws in the system in order to get it up and running correctly. That is, very roughly, the context in which we are working. (Interviewee C1)

> Yes, of course there is professional training at Case Company A, plentiful and for all occasions. However this is no different whether you're a partner or not. We can, like everyone else, book a training course, we can take the materials with us, but that has nothing to do with the partnership. (Interviewee C1)

So, the first proposition that has been discussed in the context of Case Company C cannot be supported by the there collected data. Support for the second proposition is ambiguous. The access to the technology is for sure important for Case Company C. However, a more restricted access to this technology would be desirable. Which should come as no surprise, this would give Case Company C an advantage over its competitors. The remaining proposition has been that gaining access to the existing market of Case Company A is a driver for participating in the inter-organizational IS development network. Indeed this aspect has been mentioned by the interviewee as the most important one for Case Company C. In this context the fact that Case Company C is very small, yet its customers are very large is seen as the most important aspect of the relationship.

> In most cases [large customers like ours] do have Case Company A's systems. When you are an official partner, accessing these customers is much more convenient. Simply because you're starting with a certain contact and don't have to go through 38 levels of the hierarchy. The decisions that concern the adoption of our solutions are mostly strategic, also technical and economic, but mostly strategic. So we have to talk to someone who can decide whether the customer wants to go into this direction or not. (Interviewee C1)

Gaining access to the right contact persons, who can make these strategic decisions, is thus one of the main problems of a small company like Case Company C. Helping with this issue is therefore also the most important reason why the partnership with Case Company A has been entered into.

> If you're very small, like Case Company C is, and you want to talk to the big guys you're facing a problem. That's like in the old saying, 'if you're going to bed with an elephant it's nice and warm, but you have to beware when the elephant turns.' That means you can have large customers, but the different approaches to this relationship are so significant that it's better to find a large partner who's supporting you. For us that has been Case Company A. (Interviewee C1)

So, for Case Company C, clear support has only been found for the proposition that market access is driving small vendors into the inter-organizational networks. Some support could be found for the access of technology as driving the relationship. The architectural innovativeness of Case Company A does not seem to play a role at all. The next section addresses the second research question, how small partners manage the relationships in these networks.

Management of the Network. The first proposition of how such an organizational network is supposed to be managed has been standardization. In this regard, the interviewee has a controversial opinion. On the one hand, standardized technologies are for sure playing a role in the IS development network. While these technologies are not in themselves of prime importance, they are important for other aspects of the relationship. In the example of Case Company C, this becomes especially important when it comes to educating employees. On the other hand standardization is not as far as it could be. Especially the different vendors of large system do not rely on interchangeable technologies. And, according to interviewee C1 deliberately so.

> Yes, investments in the education of employees have been necessary for the partnership. However, these are not investments specifically for our relationship with Case Company A. In order for my employees to do their job, I have to educate them anyway. If this would have happened exactly in this fashion, I think yes but that does not necessarily have to be the case. (Interviewee C1)

> The world is not simple enough to support two or three large system providers. The reason is that these providers are, for sure even deliberately so, too different, especially with regard to technology. You simply cannot switch the underlying system on a daily basis. The basic functionality that is offered by these systems is identically, but that's the management perspective. From a technical perspective they are really absolutely different. (Interviewee C1)

Thus, while standardized technologies for sure facilitate the cooperation, these standards are not considered comprehensive enough by Case Company C. The second management mechanism that has been proposed is the monitoring of partners. The data collected in Case Company C confirms the perception that monitoring on behalf of the hub organizations is a crucial ingredient for managing the network. So, interviewee C1 discussed the process how Case Company C got certified in considerable detail. However, there is even no clear understanding of how this process is working:

> If you have a certified product you also have the opportunity to officially become software partner. In order to apply for this partnership you have to provide Case Company A with a host of data concerning your company. This

> data is then run through an internal process, I have seen this afterwards. They are testing the information you provided. That is a rather complex process that can last a long time. (Interviewee C1)

So, as there is no clear understanding of how the internal certification processes at Case Company A are working, there is also no reverse of this process, the monitoring of Case Company A by its partners. However, this is not only not done, but in the perception of Interviewee C1 also not considered to be important.

> Right now, I would say that the involved risks are manageable. Case Company A is not that kind of partner who is constantly looking for other partners, and who suddenly stops doing business with us. We are not at a level where we're in danger that Case Company A could and would stop the entire business relationship from one day to the next. (Interviewee C1)
>
> That Case Company A is going bankrupt is a probability that is very close to zero, so the risks are manageable. (Interviewee C1)

So, Case Company C does not have institutionalized any formal mechanisms that help to provide an insight into its large partner. The only 'monitoring' that is conducted is an informal evaluation of the state of the relationship by the CEO and the board of directors.

> The partnership is judged to be positive from both myself and the board of directors. That is done without any sophisticated measurements. Collecting these measurements would also be very difficult. Projects are often acquired due to recommendations of others, but how do you assign this project to a partner? For sure he has played a role, but if you're not doing a good job all recommendations in the world are of no help. So, I would not know how I should collect these measurements if I wanted to, that is impossible. (Interviewee C1)

Thus, the two so far discussed propositions cannot be univocally supported by the data collected in Case Company C. The remaining proposition has been that managing a relationship is done through intense personal, trusting relationships. Especially this mechanism has been brought forward by interviewee C1 in various instances. As it has been mentioned in the company description, (personal) relationships to Case Company A existed even before Case Company C has been founded. These personal relationships are still the most prominent management mechanism that is employed by Case Company C, a fact that is very well illustrated by the following two quotes:

> If you know each other long enough you're treated differently than if you're completely new. This is the old rule: Business deals are conducted between persons, the same is true for partnerships. In many instances you have people with whom you have cooperated now for four or five years and had solely good experiences. That is coining such a relationship, through this you get access to the next deal, the next project runs just a little smoother. Furthermore, you can overcome obstacles more easily then during the ramp-up phase. If you know the right person, that only costs you one phone call. (Interviewee C1)

> Case Company C, in parallel to the board of directors that we need to have as a publicly traded company, also has a technical board. This body does not have any supervisory function, it is only consulting in technical questions. We have two university professors in this technical board. The third member of this board is [a high ranking member of Case Company A]. Through such channels we're also supported in a non-material way. (Interviewee C1)

Summing up the so far conduced discussion on Case Company C, it has to be stated that only three out of the six theoretically proposed aspects are really of considerable importance. The overriding reason why this company participates in the IS development network is the simpler access to large customers. The overriding management mechanism that is applied by Case Company C is the reliance on close personal relationships.

4.2.2 Case Company D

Case Company Description. Case Company D is specialized in solutions for Product Lifecycle Management (PLM). This field includes software for managing the entire lifecycle of a product, from conception through engineering and production to service and disposal. The systems most often mentioned in this context are Computer Aided Design (CAD), Computer Aided Engineering (CAE), and Computer Aided Manufacturing (CAM) systems. Case Company D also grew out of this context. The organization started to sell CAD software from a specific vendor (not Case Company A). Soon after, Case Company D also started to develop its own software solutions, that were to a large extend still add-ons to the system that the company has originally specialized in selling. Today, Case Company D offers the entire range of solutions, from hardware over software to services, in the PLM context. Furthermore, it also offers *application management outsourcing* in this context. In contrast to classic outsourcing the serviced infrastructure is located on the premises of and owned by the customers. Thus, Case Company D only provides manpower and specific know-how for the maintenance of these systems. In this context, the key focus of Case Company D is running the hardware, developing individually tailored software solutions, and consulting the customers with

regard to implementing and integrating standardized software packages. Case Company D can therefore be considered a sophisticated IS service provider with a differentiated service portfolio.

Case Company D has been founded in 1988, and went public in 1998. Today, it has more than 500 employees and is thus the biggest of all analyzed spoke companies[15]. The company has eight locations in Germany and also one in each of the countries of Bulgaria, France, Switzerland, and the USA. It serves multiple in part very large customers, but also small and medium sized businesses. As the focus of the company suggests, most of these are from the engineering and here especially from the automotive industries. Despite the size of Case Company D, only one interview partner could be acquired. The interviewee has been working in the business development for the company's solutions for several years. In addition to the analysis and the assessment of new business opportunities, the interviewee is also one of the key persons in charge for partnerships with other software companies.

As it has been mentioned, Case Company D started its partnerships with the developer of a CAD software system. However, in the year 2000, the company started to develop interfaces for its existing solutions into the systems of Case Company A. Consequently, also in the year 2000, Case Company D got certified by Case Company A. Today, the CAD software and the systems of Case Company A are closely inter-connected in that Case Company A is actively supporting the integration of the two systems. Thus, services in this context are one of the most important lines of business for Case Company D.

Reasons for Participating in the Network. It has been the first propositions, that smaller vendors are attracted to IS development networks because the large hubs are able to enforce architectural innovations. However, this is exactly not the case for Case Company D. Here, the interviewee sees these architectural innovations more as a difficulty in the cooperation than as a benefit:

> If we're developing a new product we have to calculate a business case which includes how many licenses we can sell over the years. In this context we already have to consider the development of our partners' underlying systems. Is there a new architecture coming in the future? If the system is changed to a completely new architecture, to new standards, the risk that I cannot sell my solution any more is significant. This consideration is part of a trade off as to whether develop such a new solution or not. (Interviewee D1)

So, the architectural innovativeness of the hub organization cannot be seen as an important benefit of the participation in an IS development network. The second proposition has been that accessing the technical base of the hub company is key for this

[15] This number is only slightly more than one percent of the total number of employees of Case Company A. For Case Company B, this number is even lower. This very well illustrates the difference in size between hubs and spokes.

participation. Indeed this proposition is well supported by the data collected in Case Company D. Here, however, the specific nature of this case has to be mentioned. Case Company D acts as an agent between the company that is developing the CAD system and Case Company A. Obviously, CAD systems are of an enormous inherent technological complexity, in the same way as Case Company A's system is of an enormous inherent business complexity. Consequently, integrating these with Case Company A's systems is rather left to partners than conducted by the developers of these systems:

> So, if Case Company A gets a request to integrate their systems with the CAD or PLM world, we are asked to do this integration, concerning both products and services. We provide the technical know-how that Case Company A does not have, but we also provide the business know-how that our other partner does not have. (Interviewee D1)

The last proposed benefit has been the fact that smaller software vendors can increase their market access through partnering with hub companies. For Case Company D this proposition is very well supported, even from the perspectives of both its large partners. Especially important is the accessing of new markets, for example geographically separated ones that have so far not been addressed by Case Company D.

> One thing is clear, both companies with which we have intense partnerships are world market leaders in their specific area. Thus, it is very important for us to have partnerships with those companies, as in the end we profit from this market presence. For us as a company which is very much focused on the German market, we only have a few smaller subsidiaries worldwide, it is very difficult to gain an international foothold. Especially as a company that is not very well known in a specific environment, it is eminent to have a strong partner. (Interviewee D1)

> From a strategic perspective, this profiting from the worldwide market presence and through this also the generation of growth have been the main reasons for partnering. (Interviewee D1)

Thus, support could be found for the propositions on accessing technical capabilities and market reach. However, no support has been found for the proposition that architectural innovations are a key benefit of partnering for smaller companies.

Management of the Network. The first proposition on how the relationships in such a network should be managed has been through standardization. Case Company D also recognizes this importance of standards for the integration effort that is key to their business model. However, as Interviewee D1 stated, standards are not perceived to be entirely beneficial for the business of his company. Rather, the actual reason why Case Company D exists are shortcomings of existing standards. The company has specialized on interfaces between two systems, and in case that these interfaces could indeed be standardized, Case Company A would loose its raison d'être.

> During our early years the following has been our unique selling point in comparison to others who were selling these systems: We were not only able to offer the standard, but we could also close certain other gaps that the customer had. (Interviewee D1)
>
> What has happened is that certain functionalities that have been part of our solution appeared as part of the standard system. When that happened, we had a tough time selling our products. The added value has been much less if this functionality is part of the standard system. (Interviewee D1)

Albeit it has not been explicitly mentioned, it can be assumed that Case Company D also relies to some extent on standards. However, the business model of this company clearly is the exploitation of shortcomings in existing standards. Thus, the first proposition for management mechanisms cannot be fully supported. The second proposition has been the monitoring of partners. Here, Case Company D is facing considerable difficulties. Albeit, the management of this company is well aware that a monitoring of partner relationships would be desirable, Interviewee D1 sees no feasible way to actually conduct this monitoring.

> Of course we are getting large projects in this context only because we are profiting from the skills that we have in our partners' solutions. I believe that this has a significant impact on our success. However, measuring this is not easy. (Interviewee D1)
>
> As today we do not systematically evaluate our partnerships. However, as I said, our partnerships are very complex. We have a partnership in sales, one in services, one in development. Determining whether we would also have gotten the project at customer XYZ if we wouldn't have had the partnership? I don't know. In this context I would rather consider the overall picture than each single partnership. (Interviewee D1)

So, albeit monitoring the partners would be desirable, it is not systematically done by Case Company D. Despite the fact that this is recognized, Interviewee D1 has not mentioned any deteriorating effects that this missing monitoring has on the relationship to Case Company A. Thus, monitoring is not used, yet it is also not gravely missed. The last proposed management mechanism has been the building of personal, trusting relationships. This proposition is well supported by the data that has been collected in Case Company D. Again only one quote is given exemplary for this mechanism:

> If you want to be successful, personal contacts are the most important thing. That is true for the relationships with larger partner just as well as with smaller ones. A lot depends on the management of personal relationships. Just to sign a contract between two partners, to meet twice a year to exchange some figures and numbers, that type of relationship will not be successful.

> At least not in our case. The relationship has to be really intense, you have to talk to each other on a regular basis, you have to meet and support each other. (Interviewee D1)

Summing up this case narrative, only partial support for the developed propositions has been found. Innovation on an architectural level has been perceived as obstacle in the relationship rather than as benefit. Technical capabilities are important in this specific case. Even more important is the access to existing markets. Standardization is used, however, the shortcomings of standards are key to the company's business model. Monitoring the hub is recognized as being somewhat important, yet the fact that it is not really done is not considered to be a serious handicap in the relationship. As a last point, close personal relationship are seen as the most important aspect of managing the relationships in the inter-organizational IS development network.

4.2.3 Case Company E

Case Company Description. Case Company E has been founded as an engineering company specialized in manufacturing plant development and in microelectronics. One key aspect of this line of business has been the development and deployment of tailor made software and hardware solutions for these manufacturing plants. Parallel to this technical focus, Case Company E has been looking for a diversification in its revenue sources. In this context, Case Company E has acquired a software firm that has specialized on the integration of existing groupware solutions in Case Company A's system in 2003.

Case Company E has roughly 200 employees, and four office locations in Germany. Furthermore, the company has one subsidiary in the Czech Republic. The organization is divided into three main divisions, two focused on engineering and one on software solutions. Roughly half of the 200 employees are concerned with software development. However, as the department that is focused on developing the solution that is integrating with Case Company A's system has been acquired only in 2003, it is still rather small. Only about ten software developers are working in this department, the remaining developers are working in the engineering departments. Consequently, customers of Case Company E are also found mainly in the manufacturing industries like automotive, chemistry, or power generation.

The interview in Case Company E has been conducted with the head of the business solution department. In this context, it has to be also mentioned that the relationship with Case Company A is not based on a rich history. The official partner status has been reached in early 2006. Why this partnership has been entered in and how it has developed since then is subsequently discussed.

Reasons for Participating in the Network. The reasons that the interviewee in Case Company E has been given for the participation in the IS development network of Case Company A have been largely limited to market access benefits. Architectural innovation has not been mentioned in a single instance. Accessing the technological base has been mentioned in two instances, but rather as a prerequisite for accessing the market of Case Company A's customers.

> Yes we had to educate our people. Especially in the basic technologies development and administration would be infeasible without this education. That's true, of course. (Interviewee E1)

In contrast to this secondary role that the existing technologies of Case Company A are playing, accessing new markets has been the dominating theme throughout the interview in Case Company E. This has been repeatedly mentioned by Interviewee E1.

> The entire partnership is based on making business. On the one hand, Case Company A wants to sell additional licenses. On the other hand we also want to sell our solutions. (Interviewee E1)
>
> I think that this is a mutual business. Both partners are trying to acquire new customers. (Interviewee E1)

As it has been assumed in the theoretical discussion on this topic, the underlying rationale for most smaller solution vendors is the fact that Case Company A has a broad, also international, customer base. This broad existing market has also been the key reason for Case Company E to participate in the IS development network.

> The sales aspect is the most important one. Together with Case Company A we can access new customers and new markets, both national and international. (Interviewee E1)

Case Company E is especially interesting, as the partnership has been forged only roughly one year ago. As the access to the existing customer base of Case Company A has been mentioned as *the* strongest reason for partnering, this give additional support for Proposition M_S. Subsequently, the management mechanisms employed by Case Company E are discussed.

Management of the Network. As the partnership with Case Company A has so far not been lasting for a long time, the management of the relationship of this case company is promising to yield very interesting results. Interviewee E1 believes that standardization is indeed playing an important role in the IS development network. However, he addresses this aspect from a very different viewpoint that what has been theoretically developed, and argues that there is a danger luring in the emergence of comprehensive standards. Indeed, he sees standardization as a danger to the entire partner model of Case Company A:

> A general risk to the partnerships are Service Oriented Architectures. Up to now the business model has been that Case Company A is selling its system to a customer and the partners then do integration projects. Now, Case Company A is offering open interfaces and certain development tools, customers can add functionalities easily and quickly themselves. (...) Most customers have their own software developers. If they can easily access the system themselves, why do they need partners? (Interviewee E1)

This quote very well shows a danger especially for those partners that have so far integrated solutions from other, third party companies. As this integration effort is reduced, the need for those partners ceases to exist. The aspect of monitoring the partner has again only been mentioned from Case Company A's perspective. The certification process has been an important theme during the interview. However, the monitoring of Case Company A by the smaller spoke organization has not been considered. Overall the partnership is considered to be successful by Case Company E, however no systematic evaluation of why this is the case could be found in this case. What is very interesting is the fact that - albeit the partnership officially exists only for about one year - the importance of personal ties for this relationship has already been clearly recognized by Case Company E.

> Yes, yes, personal relationships are very important. I do have a couple of contacts in Case company A. I know them very well and they do support us. (Interviewee E1)
>
> You need a couple of contacts, you need to know people. You can also go the official way, but the official way takes forever. (Interviewee E1)

So, again here only the last proposition of how relationships in an IS development network are managed is supported. Even for an organization that is officially partner only for one year and that is besides that very small, personal ties are considered to be the most important aspect of this relationship. The proposition that standardized technology is a key mechanism for managing the relationships has even been clearly contradicted in the perception that standards are actually harmful for the partners.

4.2.4 Case Company F

Case Company Description. Case Company F is developing software for automatic, mobile data recording. They offer solutions for automatic identification through various underlying technologies like, for example, bar codes or radio technology like RFID[16]. Recently, Case Company F also developed a voice controlled system that can be used

[16] RFID stands for *Radio Frequency Identification*. It refers to a technology which uses transponders (or *tags*) to store and remotely (without necessary intervisibility) retrieve data. Through this technology, flows of goods can be optimized.

with head sets, and thus allows for example warehousemen to work with both hands while using the system. In this context, Case Company F is cooperating in diverse partnerships and is thus able to offer the entire spectrum of hard- and software and the accompanying services, ranging from specification over implementation to training.

Case Company F has been founded in 1992. In its early years, the company developed a very broad solutions portfolio out of the original line of business of the founder and managing director, which had been cash registers. Case Company F is a small company which employs less than twenty people at a single location in Germany. The company's customers are working in a variety of industries, especially logistics, production, and commerce. In general, these customers are of magnitudes larger than Case Company F, often having thousands of employees.

In 1998, today's second managing director joined the company. With him, the focus of the company shifted towards Case Company A's systems. In the same year Case Company F also officially became partner of Case Company A. Their solutions are specialized on integrating the various hard- and software functionalities in the above described context with the general business applications provided by Case Company A. The interview has been conducted with an employee who is responsible for accounting, business development and marketing, and partner contracts. By request of the interviewee the discussion has not been tape recorded. Instead verbatim field notes have been taken independently by both the researcher and a graduate student. After the interview both interviewers have discussed their sets of notes and a written summary has been crafted. The subsequent discussion is to a large extent based on this summary. As this approach is rather limited in comparison to the tape recording conducted in the other cases, only a few quotes are given in this case.

Reasons for Participating in the Network. The only reason that has been mentioned in the interview has again been the accessing of new markets. Especially the fact that Case Company A is one of the dominating players in the global IS industry has been a driving force behind the decision to partner with this organization.

> The main goal of Case Company F to partner with Case Company A are benefits in marketing and sales. This especially because Case Company A has a market share of approximately 80 percent, especially in Germany. We want to take advantage of that. (Interviewee F1)

Case Company F also explicitly attempts to internationalize its business. In this context, the partnership with Case Company A is seen as crucial. Especially due to the small size of Case Company F, this strategic thrust could not be followed without the use of a strong partner that is already internationally well recognized.

Other reasons have not been mentioned explicitly as goals of Case Company F. However, it has been mentioned that the company sees itself in the role of a technical facilitator. Especially because the projects of Case Company F involve the integration

of sophisticated hardware with the business application systems of Case Company A. Thus, it can be argued that technical integration does play a role in the participation of Case Company F in the IS development network. However, this technical integration is more a reason for Case Company A to partner with Case Company F than vice versa.

Management of the Network. When it comes to managing the relationships in the network, Case Company F recognizes the importance of standards. However, the focus of Case Company F is currently the integration with the system of Case Company A. Standards in this context are currently not far enough developed in order to support the integration with other vendors' systems. Especially not due to the small size of Case Company F.

> There are no general objections against using our know-how with other partners. Our developers could easily work on a different platform. However, to support multiple platforms we're simply too small. (Interviewee F1)

Thus, standardization is seen as a positive aspect, however its limitations are clearly recognized. Close to the same is true for the other management mechanism, monitoring. Case Company F is systematically monitoring its partners, however usually before a relationship is entered into. Once the partnership has been officially commenced, the systematic monitoring is problematic. Especially, the intended developments of Case Company A's systems are less than transparent. Consequently, Case Company F is extensively using the final management mechanism, close personal relationships. These personal ties are especially used as a substitute for the impossible monitoring of Case Company A. The importance of this mechanism is recognized by Case Company F, and it is employed to a considerable extend. As interviewee F1 comments on this topic:

> If issues emerge, these are usually resolved through personal relationships. Generally a lot is based on trusting relationships. Consequently, having good connections with the partners is very important. (Interviewee F1)
>
> It is a risk for us that intended developments are not clearly communicated. In the worst case considerable effort on our side is wasted. We need to gather the necessary information ourselves, often times in the coffee corners of our customers. (Interviewee F1)

The basic decision to partner with Case Company A, and not any other system vendor, has also been based on the good relationships that the above mentioned second managing director had to this company. Thus, trusting personal ties are indeed heavily used in Case Company F. This not only in the relationship with Case Company A, but also with other partners. In conjoint projects, Case Company F is generating revenues based on consulting services, and hardware partners are generating revenues based on sold hardware. The risk is immanent that hardware partners are making profits on the

expense of Case Company F if they sell hardware that is not suited for the specific project. Thus, Case Company F has developed its own (unofficial) inter-organizational network in which those partners participate to which a trusting relationship has been built.

Summing the discussion up, all three management mechanisms are employed by Case Company F. Standards are playing a role, yet not a very important one. This mainly because they are not far enough developed to ensure inter-changeability between various vendors' systems. Monitoring is considered an important issue, yet one that still needs to be developed further. Thus, again the most important aspect to manage the relationships are close inter-personal ties.

4.2.5 Case Company G

Case Company Description. Case Company G is a full-range supplier of IT services for newspaper publishing companies. Its offerings range from outsourcing over third party software implementation projects to its own software solutions. These solutions are independent of other vendors' systems and geared especially to the newspaper publishing market. The strategically probably most important solution is covering complex processes in a publishing company. This solution covers standard processes like controlling or marketing, but also specialized processes, like subscription management, that are characteristic for the publishing industry. This solution is, however, not integrated with Case Company A's system. In fact, Case Companies A and G are even competitors in this field. Parallel to its own solution, Case Company G is also offering specific services in the IS development network of Case Company A. Specifically consulting services in the publishing industry play a key role in this context. However, Case Company G is also offering specific extensions for Case Company A's system. Examples are solutions for the management of advertisement, or for transforming printed newspapers into online presences.

Case Company G has been founded as a spin-off out of the data centers of various newspaper publishing companies. These companies are today still the proprietors of Case Company G. The original business model of Case Company G has been to acquire Case Company A's system and to align this system according to the specific needs of the publishing industry. The focus customers have been Case Company G's proprietors, but the services have also been offered to the open market. This has been the focus during the late 1970s and early 1980s, when mainframe computers still were the norm. Since then, the above described relationship to Case Company A emerged out of this focus. Today, both companies are inter-connected through a multitude of complex relationships. Despite this broad offering of Case Company G, the organization only employs around 100 people at one location in Germany. As it has been mentioned, the customers of Case Company G are from the publishing industry.

Case Companies A and G are thus in some aspects competitors and partners in others. Especially with regard to their offered software systems, but also in consulting services, Case Company G is a key competitor in the publishing industry. However, at the same time most of the extensions that are offered for Case Company A's system are certified. This partnership is especially strong in the newly developed solution for small and mid-sized customers that Companies A and G are developing conjointly. To make matters even more complex, Case Company G is also a customer of Case Company A. The company is buying licenses of Case Company A's system for its proprietors. In Case Company G, interviews have been conducted with three individuals that represent different aspects of this complex relationship with Case Company A. Interviewee G1 is heading the division that is developing the extensions for Case Company A's system. Interviewee G2 is head of the consulting and implementation division. Interviewee G3 is the head of the marketing department. He is not a part of the line management but rather in a staff position.

Reasons for Participating in the Network. Considering the fact that Case Company G has been founded explicitly with the intention to support its proprietors in their usage of Case Company A's systems, it is difficult to analyze the reasons for this partnership. This especially because the founding of Case Company G has happened decades ago. However, some of the underlying rationales for the partnership could be detected throughout the three interviews. So, architectural innovativeness is indeed considered to be an aspect in this partnership. The example that has been given for Case Company G is the adoption of Application Service Provisioning (ASP)[17]. However, Case Company G also recognizes that these architectural innovations are not necessarily in the partners' best interest.

> Application Service Provisioning is a model that is actively pushed by Case Company A. Perhaps that is also what we want, that we become the hosting specialist for publishing companies. We're not 100 percent sure about that yet. (Interviewee G3)

Thus, support for the first proposition is ambiguous. Architectural innovation is playing a role in the relationship, yet it is not considered to be a key benefit by Case Company G. The existing technological base of Case Company A is also not considered to be a key benefit for Case Company G's customers. Especially the fact that the publishing industry is not a key focus of Case Company A is seen as the underlying reason for this:

[17] In an ASP context, software is no longer installed on the premises of the customers. Rather, it is hosted at a central data center and customers access this software via electronic data networks.

> You have to say that the publishing industry in general is not actively pushed by Case Company A. It is simply too insignificant for that. We have to adapt the technology that Case Company A is offering for our purposes. It is not realistic to assume that the publishing industry stands any chance to alter the strategic direction of Case Company A. (Interviewee G2)

However, a direct result of this missing focus on the publishing industry is the fact that Case Company G has to have an intimate knowledge of the systems in order to successfully adapt them to the specific industry needs of its customers. This is very well recognized by the interviewees in Case Company G, and the company also invests into the building of this intimate knowledge of Case Company A's systems.

> We are really close to the existing systems. Case Company A also recognized this and they are beginning to ask for a cooperation with us in product development. These beginnings are still rather hesitant, yet it goes into this direction. (Interviewee G2)

> I would say the first-mover advantage is also part of this. Especially when it comes to innovations we are very interested in staying very close to Case Company A. We are, for example, willing to act as ramp-up customer for the publishing industry. So we're testing new solutions and through this we have the advantage to generate know-how faster than our competitors. (Interviewee G3)

So accessing and especially understanding both the innovations and the existing technology of Case Company A is seen as a necessary precondition for customer projects, rather than as a driver for the partnership. In contrast, the final proposition is well supported by the collected data. Especially the internal development of Case Company G, from a pure service provider for its proprietors to an independent participant in the IS market in the publishing industry, has been supported by this partnership.

> At some point in time it has been realized that there are only so and so many projects from our proprietors. The next step has been to say, that there is a broader market that can be addressed with the know-how that we possess. Since Case Company G had a certain size and also had highly specialized knowledge, it should be possible to tap into the full potential of this organization through acquiring more projects on the open market. With this background in mind we approached Case Company A with our request for a more intense partnering. (Interviewee G3)

Thus, the final proposition is the one best supported by the collected data. This should come as no surprise, as Case Company G is explicitly following the strategy to support publishing companies in their use of Case Company A's systems. So, addressing this market is seen as the key reason for the partnership by all the interviewees in Case Company G:

> The partnership with Case Company A is not a value in itself. The value is only there if we can realize market success through it. The best partnership does not help me, if no one buys anything from me. It is only a means to an end to bring new products to market. That is the criterion whether the partnership has been successful or not. (Interviewee G2)
>
> The long-term relationship with Case Company A is the basis for bringing our solutions and our services to market. That is our strategic direction, and I would say in this context we are market leader in Germany. (Interviewee G1)
>
> The partnership is only a means to an end. It is only the instrument for realizing market success. And a lot depends on this. (Interviewee G3)

In Case Company G again mixed support for the theoretically developed propositions has been found. Architectural innovativeness is seen as a given, yet not as a benefit of the relationship. Accessing the technology is also seen as necessary, yet again not a driving benefit. Thus, the final aspect of market access is the only proposition that is supported unambiguously. However, what is also nicely shown in this case is the inter-connection between the three aspects. It is almost impossible to understand one without the other.

Management of the Network. Concerning the first proposed mechanism for managing the relationship - standardization - good support could be found in the collected data. The fact that much of the systems that are developed by Case Company A are standardized business applications and that these possess standardized interfaces to integrate with other, specialized solutions, is seen as key to the partnership by Case Company G.

> We at Case Company G specifically address the publishing industry. In this we are supported by Case Company A through their standardized solutions, such as human resources, financials, or controlling. This is their domain, they know that very well. (Interviewee G1)
>
> Case Company A is coming from the business side. They need partners that use their standardized interfaces to integrate the more technical solutions in the entire process of publishing media. (Interviewee G2)

Thus, standardization is considered to be an important aspect of managing the relationship. In the perception of Case Company G, the same is true for monitoring. The intense monitoring by Case Company A is recognized and understood by Case Company G. However, it has been questioned whether the reverse is also true. Especially the information policy concerning the further development of Case Company A's systems has been criticized.

> Where we're facing tedious and cumbersome discussions with Case Company A is in the strategic direction of their solution development. What is the roadmap for the solutions, how are they further developed? We are involved in these discussions, we can contribute. But we receive relatively little feedback about the decisions, especially concerning the dates when a certain solution is available. Case Company A is having a very restrictive information policy. They only publish what actually is already officially available. (Interviewee G2)

> Concerning solution development, we have very little capability to influence this. We don't know if Case Company A is developing anything at all in a certain area. If they do, we don't know when they are developing it. So we have to decide as to whether we want to address these gaps ourselves and offer our solution to the customers, with the risk involved that Case Company A is offering the same functionality as part of their system. This is a real problem in the partnership. (Interviewee G1)

> What do you want to measure in such a relationship? The only thing how you can approach this is, you say Case Company A is supposed to respond in such a way, but they don't do it. It's a long way to a working relationship. (Interviewee G3)

So, it can be argued that Case Company G is attempting to monitor their partnership. Yet this monitoring is not feasible, as Case Company A is not acting in a transparent enough way. This missing transparency is also considered to be a key aspect when it comes to the last management mechanism, personal relationships. Case Company G realizes that these personal ties are important for the management of the relationship.

> Insofar, Case Company A is supporting us in that they ask for our participation in specific projects. So we're acquiring projects through our contacts with Case Company A. That is how it works in real life. (Interviewee G3)

However, Case Company G is not really satisfied with this management through personal relationships. Especially with regard to the above mentioned missing transparency in the relationship, personal ties are not seen as an appropriate means to overcome this issue. Thus, Case Company G is attempting to formalize this cooperation through written contracts in which the obligations of each partner are clearly spelled out. However, the difficulties of this approach are also recognized.

> We are missing the reciprocity. That Case Company A is clearly communicating what the focal areas are for the next couple of years. Official feedback of this kind is non-existent. Essentially you can only guess what Case Company A is doing. You have to know your contacts very well in order to get some idea of this development. But there is never any official statement

> that can be used at a customer. Based on this diffuse information we are then developing a gut feeling that our development decisions are based upon. Obviously this is a very risky approach. (Interviewee G2)
>
> The disadvantage of oral agreements is simply the fact that in the past it has shown that Case Company A is making turnarounds which we are not informed about. We are unable to influence these turnarounds, despite the fact that we had a very productive relationship in the past. So the conclusion has to be drawn that we need a formal agreement on how we are to approach joint operations. These regulations have been formalized in a contract that is also accepted by Case Company A. (Interviewee G3)
>
> Another point is that we have formalized our cooperation through this contract in a way that increases the transparency in the relationship. We communicate our goals and our partner is communicating his goals. We talk about this and conjointly reach a decision. It is very important that we address the market with the same pace, with the same frequency. This has not happened in the past. Now we're perceived very differently by the market. (Interviewee G3)

So, albeit the fact that personal ties are very important, they are not the ideal way to manage the relationship. Summing up the discussion, Case Company G perceives many differences between how the relationship should be managed and how it actually is managed. Monitoring Case Company A is desired, yet almost impossible to achieve. Personal ties are used, yet the dependence on them is also considered highly insecure.

4.2.6 Case Company H

Case Company Description. Case Company H is developing solutions for data archiving. The solution has been developed since data bases for Case Company A's mainframe system have been subject to sharp restrictions concerning their size. As soon as this restriction has been reached, data had to be stored in external devices. This resulted in the inability of the system to access these data for analysis and reporting. Case Company H has developed a solution that enabled customers to access these externally stored data. Current systems are not subject to these restrictions any more. However, even today many customers want - especially due to performance reasons - further reaching archiving functionality than what is offered by Case Company A. Other customers have to archive their data for a very long time due to legal reasons. Both requirements can be fulfilled by the archiving solution of Case Company H. Thus, the organization focuses especially on very large customers.

Case Company H has been founded in 1991. Today, the company employs 30 professionals in one location in Germany. Its customers are, as it has been mentioned, mostly large, international corporations. Especially those companies that generate a lot

of data during their operations are at the focus of Case Company H. Therefore it serves customers from all kinds of industries, such as automotive, manufacturing, oil and gas, pharmaceuticals, but also postal services or transportation.

The relationship to Case Company A has been a quintessential part of Case Company H ever since it has been founded. The relationship during the first couple of years has been an unofficial one. The solution developed by Case Company H has been officially certified by Case Company A in 1999. Since then Case Company H sells its solution to customers of Case Company A that require enhanced archiving solutions. The interview in this company has been conducted with the head of sales and marketing. As part of this function, the interviewee is also responsible for the coordination of the partnership to Case Company A.

Reasons for Participating in the Network. Concerning the reasons for participating in Case Company A's IS development network, the interviewee has a very clear opinion. Case Company H's original line of business has been and still is the development of additional archiving functionalities going beyond what is offered in the standard system. Consequently, architectural innovativeness has not been mentioned as a driver for this participation in a single instance. Support for the first proposition could therefore not be found in the data collected for this case. However, the second proposition could be supported very well. This should come as no surprise, as the technical integration with Case Company A's system is a necessary precondition for the developed solution.

> We have an explicit technology partnership since a couple of years ago. We cooperate with Case Company A because our solutions are complementing each other. That is very important for our solutions. We are developing connectors between Case Company A's systems and archiving systems. These connectors are attached very closely to Case Company A's system. (Interviewee H1)

> We are developing new add-on solutions for Case Company A's system. Therefore it is obviously imperative that we cooperate very closely with our partner in order to facilitate this development. (Interviewee H1)

So, while accessing the technological base of Case Company A is very important for Case Company H, in the end, addressing customers is the driving strategic goal for Case Company H.

> Of course the strategic goal for the partnership is to further grow as company through increasing our revenues. (Interviewee H1)

So, while architectural innovation is not playing an important role in the partnership, both accessing the technology and the existing market are crucial for Case Company H. Obviously, both aspects are highly intertwined in this case. Only through the in-depth knowledge of the existing technologies, new solutions can be developed that offer an added value for the customers of Case Company A.

Management of the Network. Especially in the business of Case Company H, standardized interfaces play a very important role for managing the relationship to the partners. In the system of Case Company A, several of these standardized interfaces are used by Case Company H to attach their solution to the existing system. However, what is also recognized in this case is the fact that standards are only beneficial of the smaller partners, if the large hub company adheres to the given promise to not go beyond the standardized interfaces. As soon as this promise is no longer upheld, Case Company H is facing severe problems.

> There are specific points at which Case Company A is developing standardized interfaces. It then says, look we do not develop anything that goes beyond this interface. We have third party solutions from our partners available on the market. These decisions have been reached in a professional and cooperative way. Insofar I hope that we maintain this professional and cooperative way, because this is absolutely necessary for the success of our business. (Interviewee H1)

> For sure it is a very substantial risk that Case Company A is offering a comprehensive solution as part of their standard. That would make our solution obsolete. We would instantly feel that. That's one of the risks. (Interviewee H1)

Concerning the monitoring of Case Company A, it is also recognized that this endeavor is infeasible. Yet it is also not perceived to be of prime importance. The only aspect that is recognized as potentially harmful is the missing clear communication of where Case Company A sees its future development paths.

> We cannot measure a strategic partnership like the one with Case Company A in numbers. It for sure has a very significant influence on our own development, that's why we're very interested in fostering this relationship. For sure our overall success depends to no small degree on that relationship. Simply because we are specialized in developing add-on solutions for their system. However, we do not expect that Case Company A is going bankrupt or becoming insolvent tomorrow. Thus, we can rest easily. (Interviewee H1)

Again, the final proposed management mechanism is the one that has been supported mostly throughout the interview in Case Company H. Subsequently, two quotes illustrate the importance of close personal ties for the success of the partnership for Case Company H.

> We are profiting from the partnership because we are working with our contact persons now for a very long time. Through this, something like a permanent conversation emerged, through which we get advice concerning imminent risks but also potential prospects. (Interviewee H1)

> The success in the detail is dependent on the involved people. They have to live the relationship, they have to be motivated, they have to drive the relationship, call their contacts, meet with them, talk over this or that issue. The partnership has to be a living thing in order to ensure long-term success. (Interviewee H1)

Thus, support could be found for the first proposition, that standardization is key for managing the relationship to Case Company A. However, the danger that Case Company A is augmenting its standardized offerings is a constant threat to Case Company H. The proposition that monitoring the larger partner is important could not be supported. This point is neither perceived to be desirable nor feasible. Finally, good support could be found for the proposition that the relationship is managed through close, inter-personal ties.

4.2.7 Case Company I

Case Company Description. Case Company I is developing solutions in the area of *Enterprise Output Management*. This field involves the creation of documents, both in print and electronically. Especially for high volume document handling, the solutions of Case Company I offer various advantages over standardized solutions. The solutions for example allow for a better traceability of each printing process. Case Company I also develops solutions for electronic document handling, which includes for example digital signatures as an important feature. Finally, Case Company I also offers consulting services, which are often part of the implementation projects for the company's software solution.

Case Company I has been founded in 1994. Its customers are obviously mainly those organizations that need high volume document handling. Especially public utility companies, big mail order firms, in growing numbers also banks and insurance companies, but also manufacturing companies have been mentioned in the interview. The company employs a low two-digit number of professionals in one location in Germany.

Throughout its history, Case Company I has been involved in many partnerships. Especially, technological partnerships with the providers of the actual printers have been of prime importance. However, in 2001 Case Company I decided to not only partner with the destination of the printing data, but also officially partner with the source. This has been often enough one of Case Company A's systems. The interviewee is the head of software development, who is, in this function, also responsible for the partnerships of Case Company I. The interview has been conducted via telephone. No approval has been given to tape recorded it. However, intense field notes have been taken. These notes have also been briefly discussed with and approved by the interviewee at a personal follow-up meeting. Furthermore, the interviewee himself has also briefly answered the question in writing and offered these answers to the researcher.

Reasons for Participating in the Network. Several reasons for participating in the network of Case Company A have been mentioned in the interview. Arranging them in accordance with the proposed benefits of such an approach, again no support could be found for the idea that architectural innovations play an important role in this decision. The second proposition, accessing the technological base, has been mentioned by Interviewee I1. However, the partnership with Case Company A goes beyond the pure access to technology, rather this partnership is intended to realize *both*, technical and strategic goals.

> In order to realize the different requirements for our solution we have various very important technical partnerships. However, the focus of this interview is specifically the technical and strategic partnership with Case Company A. This partnership exists since 2001 and it had the original goal to integrate our solution with the system of Case Company A through certified interfaces. (Interviewee I1)

Thus, technical access is indeed an important aspect of the relationship between the two companies. However, there is also another aspect, what has been termed *strategic*. This aspect can be considered as part of the final proposition, the accessing of existing markets of Case Company A. Interviewee I1 very well illustrates two aspects of this strategic goal of the partnership. First, he argues that the certification makes a difference for customers; second he argues that the large existing installed base of Case Company A is a great benefit for smaller partners, like Case Company I.

> It is clearly observable that customers attach great importance to this partnership. In part, this certification with Case Company A makes the difference in sales situations. Case Company I is favored over competitors due to this partnership. (Interviewee I1)
>
> Through the partnership with Case Company A, Case Company I has an advantage over its competitors. Roughly 80 percent of our customers are using Case Company A's system. Since these customers favor a certified solution, we can generate additional revenues in this context. (Interviewee I1)

So, no support at all has been found for the proposition on architectural innovativeness of the hub as a benefit for the spoke. Further, accessing the technological base has been mentioned as an explicit key benefit of the partnership with Case Company A. Furthermore, this aspect has been considered to be a precondition for the final proposed benefit, the access to existing markets. This aspect has been well supported in the interview.

Management of the Network. Concerning the mechanisms through which the relationship is managed, Case Company I has a very distinct perspective on standards. Interviewee I1 argues that indeed standards are very far developed, so that integration on the basis of standardized interfaces could be achieved even without the awareness of Case Company A.

> The goal of the cooperation with Case Company A has been the certification of our solution's interfaces to the system of Case Company A. We could have developed these interfaces and attach our solution completely without the cooperation with Case Company A. Many solution developers actually do this. (Interviewee I1)

However, the above conducted discussion on the benefits of certification renders this approach not a feasible option. Rather, Case Company I has gone through the certification process in order to signal the inter-operability of their solutions to the customers. However, while Case Company A is heavily monitoring its partners, Interviewee I1 also recognized that this monitoring is not possible for the smaller partners. He sees this as a shortcoming in the partnership and as an inherent risk to it.

> One of the disadvantages of the partnership is the fact that we have to continuously keep track of the strategic and technical developments of Case Company A. The larger partners often make strategic decisions, for example concerning the interfaces to their system, without considering the smaller partners. (Interviewee I1)

According to Interviewee I1, this is also tangible in the personal relationships in-between partners. Efforts on the side of Case Company A are recognized. However, it is first of all doubted whether these efforts are effective in improving the relationship. Further, it is doubted whether these efforts are indeed taken serious.

> Despite all the efforts of the 'large' partners to create a level playing field through a specifically installed partner management, a certain imbalance has emerged in the relationship so that one cannot really talk of a 'partnership' in all instances. (Interviewee I1)
>
> Furthermore, it has to be noted that the partnerships are becoming more and more anonymous. There are no personal meetings on a management level in order to agree on strategic directions. Rather, only mailing lists and web sites are used to disseminate information. It has turned into a 'push' service from the large partners to the small partners. (Interviewee I1)

Thus, for Case Company I support has been found that standardized interfaces play an important role in the management of the relationship to the larger partner. The support for monitoring has been less distinct. Again, it has been argued that in principle such a monitoring is desirable, yet that it is almost infeasible to actually conduct it. Finally, personal relationships have been considered important for Case Company I, yet less so for its large partner.

4.2.8 Case Company J

Case Company Description. Company J develops *Product Information Management* (PIM) solutions. This software solution is essential for cross-media publishing. In this context, product information that is stored in a central repository can be used for various communication channels. In general, this information is used to design outlets like catalogs, price lists, booklets, or flyers. The solutions of Case Company J also enable the design of instruction manuals or maintenance guidelines out of the stored data. These outlets are often printed, yet electronic publishing - for example through the Internet or on a CD - is also possible. In international contexts, the solution can also be used to automatically adjust the language according to the context. Usually the therefore required data is scattered in various data bases throughout the entire organization, and the design of these outlets is preceded by a manual data collection process. In contrast, the solution of Case Company J allows a higher degree of automation for this process of publication in various media types. The offering of Case Company J involves not only the system, but also services that are required in an implementation project. The company also offers outsourcing services in that it maintains the systems, either on premise on in the data center of Case Company J.

Case Company J has been founded in 1999 and as of today has roughly 40 employees. Its main location is in Germany, and the company has sales offices in Austria and Switzerland. Case Company J is serving customers of various sizes from different industries. In general, the solution is more interesting for larger corporations that produce a larger number of products, and perhaps even have to publish globally in different languages and types of media. Thus, it is not uncommon for the customers to be global players with up to one thousand times more employees than Case Company J.

The relationship between Case Companies A and J has been implicitly given since the founding of Case Company J. Especially because many data are extracted from systems like that of Case Company A, the developed solution need to access these systems. In 2003 the relationship between the two organizations has been formalized in that Case Company J's solution has been officially certified. In this company two interviews have been conducted. Interviewee J2 is the managing director of the company. Interviewee J1 is heading the sales department.

Reasons for Participating in the Network. Analyzing the reasons why Case Company J is partnering with Case Company A, again accessing markets has played the dominant role in the interviews. Architectural innovativeness of the hub organization has not been mentioned with a single word by either of the two interviewees. Accessing an existing technological base has been mentioned, however not in the context of the partnership with Case Company A. In contrast, Case Company J explicitly distinguishes between those partnerships that allow the company to access technologies, and those that allow it to access markets. The first is explicitly in the context of data bases or output management systems, while the latter is in the context of enterprise IS, like those developed by Case Company A.

> We have one area of partnerships, that's technology partnerships. Then we have, and that is the second focus, the area of integration partnerships, and closely related to this, sales partnerships. (Interviewee J1)

Thus, it can be argued that the partnership with Case Company A is neither intended to, nor does it actually deliver access to architectural innovativeness or existing technologies. However, gaining market access has repeatedly been mentioned by both interviewees.

> One reason for partnering is that it is always difficult for a young software company to get access to the market. Through partnering with an established player, who can fill a niche in his own portfolio through this partnership, this market access is ideally much easier. Especially if a way can be found how to use the channels of this partner. That is an important point. A second important point is that a company's credibility and reliability can be very well communicated in the market through a partnership and the corresponding recommendations of a well established player. This has been especially important after the burst of the IT bubble in 2001, 2002. Customers did not dare to buy any solution from a young company, without assurance that there is sustainable development in this company that the company does not disappear in two years. Through a partnership you can get this assurance very easily. (Interviewee J2)

> It is the strategic goal of our partnerships to penetrate markets for our solution. We simply do not have the momentum to act in the markets as we wish to do. So we're trying to create awareness for our solution through various partnerships. (Interviewee J1)

Here again, the dominating role of Case Company A in the enterprise IS market has already been implicitly recognized as the driving force behind this development. Interviewee J2 makes this perception even more explicit through the following statement:

> We are actively addressing companies with more than 100 million annual revenues. In this context, the market share of Case Company A is roughly 70 percent. So the probability that we have to integrate with Case Company A's system at our customers is pretty high. (Interviewee J2)

Thus, again the dominant reason why Case Company J is partnering with Case Company A is the ability to address the large existing market of that company. The other two theoretically proposed reasons play, if at all, a secondary role.

Management of the Network. Concerning the ways and means, how Case Company J is managing its relationship with its partners, a clear support could be found for the proposition that standards play an important role in this context. Both interviewees have mentioned the fact that both partners base their solutions on standards as key for the easy integration of the solutions:

> From a technical perspective, the effort to integrate has been very limited. This admittedly because our solution is compliant with Case Company A's system. We have standardized technologies and the only thing we had to do, is develop a new design on top of that solution. That has not been a big deal. The effort has been manageable. (Interviewee J2)
>
> Technology-wise we're always using open standards where they are available. (Interviewee J1)

So, from Case Company J's perspective standards do indeed play an important and positive role in the relationship between the two partners. Interestingly, Case Company J has a pronounced perspective on monitoring as a management mechanism. First of all, the fact that Case Company A is not perceived to be very transparent in its decisions has been mentioned as harmful for the relationship in the interviews.

> You're facing conflicts in such a relationship. For example if a salesman of Case Company A wants to sell another 100 consulting days for individual development rather than selling our solution. In most of those cases, Case Company A is winning in the conflict. Simply because the smaller partner is taking a back seat in this issue. If the smaller partner would insist on his rights, he might jeopardize many other prospects. (Interviewee J2)

However, not only the fact that monitoring Case Company A is perceived to be difficult has been mentioned in the interviews. Also the fact that the certification process might lead to know-how leakage of a certain extend has been mentioned.

> There's always a lot of politics involved, and the risk that a lot of know-how is transferred to Case Company A through the certification. If you're accessing a higher level of partnerships that goes as far as opening the source code. You need a very trusting relationship for this. (Interviewee J2)

Thus, the certification process is not seen as entirely positive. Especially the close interconnection with the third proposed management mechanism, the building of close trusting personal ties, has been mentioned at various instances. So, as no transparent monitoring exists in the relationship, Case Company J actually sees these personal relationships as a substitute for monitoring the partner.

> One aspect of the partnership is to stay in contact with the responsible persons. You have to nurture all your personal ties so that you get information about potential problems in an early stage. Only then you can counteract. In the end there are always opportunities for cooperation, even if there is a certain solution overlap. You just have to get notice early enough, before there is an actual conflict. (Interviewee J2)

So, in general personal ties are considered the most important aspect of the management of the relationship. Only through these ties, a relationship can be implemented that is profitable for both involved parties.

> Managing the relationship is conducted through managing a personal network and personal ties. If the fundamental requirements, like the fit between the solutions, are fulfilled, personal ties are the nuts and bolts of the relationship. Whoever neglects this issue will not be successful in the partnership. (Interviewee J2)

Summarizing this case, indeed good support has been found for the reliance on open standards as key to the relationship. However, the monitoring of Case Company A has been described as being desirable, yet close to impossible to realize. Going even further than this, knowledge leaking dangers have been identified in the certification process. Finally, personal relationships are considered to be a fundamental building block of the partnership. Yet again, this is not seen as positive, as these are not really objective.

This has been the last spoke case narrative. In the following final section of the spoke case analysis all eight cases are compared in a cross-case analysis. It is the goal of this analysis to emphasize characteristic similarities and differences between the spokes. These are then used in the concluding discussion to develop a holistic view on the entire inter-organizational IS development network of Case Company A.

4.2.9 Cross-Case Analysis

After having discussed the eight cases in the preceding sections, this final part of the spoke case discussion aggregates these individual case narratives and forms a holistic picture of the inter-organizational IS development network from the spokes' perspective. As a first step of this aggregated analysis the number of relevant interview fragments is given in Table 4.5 for the proposed benefits and in Table 4.6 for the proposed management mechanisms.

	"Innovation"	"Technology"	"Market"
Interviewee C1	1	2	2
Interviewee D1	1	2	2
Interviewee E1	0	2	5
Interviewee F1	0	0	1
Interviewee G1	0	0	2
Interviewee G2	0	2	1
Interviewee G3	1	1	3
Interviewee H1	0	2	1
Interviewee I1	0	1	4
Interviewee J1	0	1	1
Interviewee J2	0	0	4
Sum	3	13	26
Average	0.27	1.18	2.36

Table 4.5: Relevant Interview Fragments by Benefits: Spoke Case Companies. Source: Own Assertion.

This information already very well describes what has been found in the individual case narratives: Architectural innovativeness is not considered to be of any positive relevance by any of the spokes. The accessing of existing technology is somewhat important, yet not the dominating factor of why small companies partner with a large hub. This is indeed considered to be the accessing of novel markets that is facilitated through such a partnership. Similarly, management or the relationship through standards and monitoring is considered to be of importance. However, the dominating factor in this context is the reliance on close personal relationships. However, once more the issue that qualitative case analysis cannot follow clearly prescribed rules or formulas emerges strongly in this analysis (Patton, 2002; Stake, 1995). Therefore, subsequently a content analysis of the relevant interview fragments attempts to shed more light on these aspects. Furthermore, this analysis also is intended to reveal underlying reasons for subtle differences between the spoke cases, despite them being designed as *literal replications* of each other. In this regard this cross-case analysis is similar to the procedure of the hub cases, where the *deductive* analysis of the different factors has been followed by an *inductive* analysis of relationships between them.

This content analysis is sub-divided into three parts. The first part is addressing similarities and differences in the reasons why these smaller software companies cooperate with large system developers like Case Company A. The second part then addresses similarities and differences in the management mechanisms that are used by the spoke companies. As the hub case analysis above has shown, the fact that it is a *literal* repli-

	"Standardization"	"Monitoring"	"Personal Rel."
Interviewee C1	2	5	6
Interviewee D1	2	2	2
Interviewee E1	1	1	3
Interviewee F1	1	1	2
Interviewee G1	2	2	1
Interviewee G2	1	2	1
Interviewee G3	1	2	5
Interviewee H1	2	1	6
Interviewee I1	1	2	2
Interviewee J1	1	0	0
Interviewee J2	1	3	4
Sum	15	21	32
Average	1.36	1.91	2.91

Table 4.6: Relevant Interview Fragments by Management Mechanisms: Spoke Case Companies.
Source: Own Assertion.

cation does not indicate that all case are completely identical with regard to their perceptions of the benefits and the management of the network. Rather, subtle underlying differences exist between them. These are addressed in the final part of this discussion. In this part of this section, a comprehensive line of argument is developed why certain factors are perceived differently in the eight different cases. This is then integrated into a general model which is intended to explain different kinds of partnerships.

Similarities and Differences in Benefits. Concerning the reasons why spoke companies partner with large system vendors, a clear pattern could be detected in the eight spoke cases. Indeed two out of the three propositions have been answered very similar across all cases. These two, innovation and market benefits, are thus first discussed. This fact becomes very obvious in the context of architectural innovativeness of the hub organization. For none of the discussed case companies, the architectural innovativeness of the hub has been considered as a key benefit of their relationship. In most of the cases, this dimension is not recognized as playing any role at all. An opinion on this issue has been raised only in rare exceptions. In none of the cases, architectural innovativeness has been explicitly desired by the smaller partners. Rather, in those cases that architectural innovativeness has been recognized at all, it has been felt that this newly emerging architecture has the potential to threaten the spokes' business model (Case Company D), or that the spoke is not sure about the implications of this new

development (Case Company G). However, none of the spoke cases has argued that this architectural innovativeness is seen as a key benefit for the partnership. Thus, Proposition I_S has to be clearly rejected. Architectural innovativeness on the side of the hub organization has *not* emerged as a reason for spokes to partner with the hub in the here collected data.

A clearly different picture has emerged in the discussion on accessing novel market through the partnership with Case Company A. Indeed, all interviewees in all eight spoke cases have unanimously declared that gaining access to existing markets is *the* key reason why they participate in Case Company A's inter-organizational IS development network. In this context, good support has been found for both aspects of this proposition. First, essentially all clients of spoke companies already possess a large enterprise IS. Interviewees J2, F1, and I1 explicitly mention the market share of roughly 70 to 80 percent of Case Company A. In this context, the integration with such a system simply offers additional value for customers. Next to this, there is also another aspect has been discussed in the theoretical development of the proposition. Especially the fact that spokes are by definition smaller software companies is playing an important role in this context. Here, the good reputation that such a small company can gain from the partnering with a large, well recognized organization like Case Company A is crucial. Again, good support has been found throughout the conducted interviews. Interviewees in the Case Companies G and I explicitly mentioned the fact that customers prefer their organization over competitors because of their partnership with Case Company A. Thus, clear support for the proposed benefit of market access has been found in the collected data.

A less unambiguous picture emerges in the discussion of accessing existing technology as driver for partnering with Case Company A. Here, the eight spoke case companies are almost neatly separated into two distinct groups. For one group accessing the technological base is seen as being of eminent importance (Case Companies C, D, E, H, and I). The interviewees of the other group to a large extent do not even mention the access to this technology, or if they do, they are not considering it as prime reason for partnering with Case Company A (Case Companies F, G, and J). It can be argued that for some of the spoke partners the access to the existing technologies of Case Company A is an important issue, while it is not for others. However, one similarity is given between these two groups. Neither of them considers the access to technology really as the *driving* reason for participating in such an inter-organizational network. Rather, as it has been stated above, this is the accessing of novel markets. The two groups vary in how necessary this access to technology is as a precondition for realizing the final goal of market access that all spokes do have in common.

These findings are again summarized in Table 4.7. The first proposed aspect of architectural innovation does not play a role in this decision at all. The second aspect of accessing existing technologies does play a role, depending on how important it is as a precondition for market access. This market access is the final aspect, which is important in all spoke cases. This is reflected in the table through marking whether the

	Innovation	Technology Base	Market Access
Case Company C	o	+	+
Case Company D	-	+	+
Case Company E	o	+	+
Case Company F	o	o	+
Case Company G	o	o	+
Case Company H	o	+	+
Case Company I	o	+	+
Case Company J	o	o	+

Table 4.7: The Spokes' Reasons to Participate in the Network.
Source: Own Assertion.

propositions that the access to certain factors like architectural innovation, technology, or markets is a key benefit for the spoke companies are either reversed (-), rejected (o), or supported (+).

Similarities and Differences in Management Mechanisms. The first proposition on management mechanisms used in the IS development network has been addressing standardization. The fact that this aspect plays an important part in the management of the inter-organizational relationships in the IS development network has been acknowledged in all eight cases. However, in the individual case analyses another interesting facet of this issue emerged. Not all eight case companies view standards as positive without restraint. Rather, for half of the cases a cautionary note has overshadowed the discussion of this aspect. Interestingly, in all four cases close to the same reservations have been raised. All case companies have mentioned that their solutions heavily rely on standardized interfaces that are offered as part of Case Company A's system. However, Case Companies C, D, E, and H have also mentioned that they see their solution as being endangered by enhancements on Case Company A's system's interfaces. If the interfaces are standardized to a larger extent than this is the case today, the solutions of these case companies might become obsolete. This because their business model is to explicitly address shortcomings in Case Company A's interfaces.

In contrast to this, the other four companies see standards in a more positive light. They do not feel that an enhancement of standardized interfaces of the large system would jeopardize their prospects. Thus, it can be argued that essentially all partners rely on standardized technologies and the other aspects, like standardized training, that come along with this. However, for some of the partners, standardization might also be a deteriorating effect on the partnership. The discussion on how exactly this happens is involving an active role of the hub organizations. Therefore, this discussion is postponed until the next section, which covers exactly the dynamics of the cooperation between hubs and spokes from both perspectives.

A similar perspective emerges, when comparing the perception of the eight spoke case companies with regard to the management through monitoring their partner. In this context, in all of the cases the common thread emerged, that monitoring the large partner is almost impossible. At least not through clearly defined ways. In one way or another all interviewees have argued unanimously that the information policy of Case Company A is less than transparent for the smaller partners. Thus, while the availability of standards is perceived as being actively influencing the relationship, the opposite is true for monitoring mechanisms. Exactly their absence is influencing the relationship.

However, in what perception the spokes differ is, whether this is deteriorating the relationship between them and the large vendor. For some of the cases, this absence has not even been recognized. For others, it has been argued that indeed a comprehensive monitoring is not necessary, because Case Company A has been experienced as reliable partner which does not need to be monitored (e.g. Case Companies C, D, E, and H). A reason for this can be found in the fact that the smaller companies participate in the network in order to gain a reputation of continuity in their existence through this partnership. This reputation would be harmed only if Case Company A would be in considerable difficulties that threaten its existence. As this has not been perceived to be realistic in the nearer future, this aspect is not affected by the missing transparency in the relationship. However, for another group of partners, this missing transparency is indeed considered to be deteriorating the relationship. Especially the Case Companies F, G, I, and J have explicitly criticized this fact.

Interestingly, the two groups are close to identical to the two groups that have been distinguished on the basis of whether they see the standardization that the relationship is based upon in a positive light or not. However, there is an interesting side note to this. It should be expected that especially those companies, that have raised concerns about the danger of an increasing degree of interface standardization are also extremely interested in monitoring the developments within Case Company A in order to early on recognize whether their own solution is threatened. However, exactly the opposite is true. The companies that have raised concerns with regard to the enhancement of standardized interfaces are exactly those that do not feel that a closer monitoring of Case Company A would be necessary.

A similar picture emerges in the discussion of the management through personal relationships. Just as all spoke case companies have raised the fact that standardization is playing an important role in the relationship, also all companies have brought forward their perception that personal relationships are important. Indeed, for all cases it has been stated that this management mechanism is by far *the* most important aspect of their relationship management. Different shades of these personal ties have been mentioned, ranging from trusting relationships that have been established and developed over the last couple of years (e.g. Case Company H), to the fact that a member of the technical advisory board is a high ranking member of Case Company A (Case Company C). However, while this strong reliance on personal relationships has been accepted by half of the spoke partners, the other half criticizes this approach.

Case Companies F, G, I, and J argue that from their perspective, personal relationships are only that important because no formalized monitoring exists. Thus, the personal ties act as substitute for other mechanisms intended to create more transparency in the relationship. However, as interviewees from all these case companies have argued, personal relationships are a bad substitute for formalized mechanisms. Especially the fact that these personal relationships are not working *predictably* has been raised in the interviews. So, through the reliance on personal ties for the management of the entire relationship, a significant degree of uncertainty is introduced into this relationship. This uncertainty is taken for granted by most of the spokes that do not believe that this can be changed. Some of the interviewees, however, have argued that such uncertainty should not be part of the network. Rather, formalized monitoring mechanisms should be employed.

	Standardization	Monitoring	Personal Ties
Case Company C	+/o	-/o	+/+
Case Company D	+/-	-/o	+/+
Case Company E	+/-	-/o	+/+
Case Company F	+/+	-/-	+/-
Case Company G	+/+	-/-	+/-
Case Company H	+/-	-/o	+/+
Case Company I	+/+	-/-	+/-
Case Company J	+/+	-/-	+/-

Table 4.8: The Spokes' Perception of Management Mechanisms.
Source: Own Assertion.

Table 4.8 summarizes the findings of this cross-case analysis. In this table, two symbols are given for each cell. The first symbol indicates whether a certain management mechanism is actually available in the relationship to Case Company A. The second symbol indicates whether this mechanism is perceived to be beneficial for managing the relationship. In this context the meaning of a (+) is that the mechanism is available or that it's beneficial. The meaning of an (o), which is only used with regard to being beneficial or not, is that the mechanism is neither beneficial nor harmful. The meaning of a (-) is that the mechanisms is not even available or that it is harmful. To make an example, all case companies rely on open standards for integration their solutions (+). Yet Case Company C feels that these standards are not comprehensive enough (o). In contrast Case Companies D, E, and H also see a threat in this (-), while the others consider this management mechanism as being beneficial for their relationship (+). None of the companies has reported that it is really able to monitor what Case Company A is doing (-), yet Case Companies C, D, E, and H do not see any problem in

this fact (o). Similarly, all case companies feel that personal ties are used in managing their relationship to Case Company A (+), yet Case Companies F, G, I, and J feel that this is harmful for their relationship (-).

Summing up this discussion, two distinct groups of spoke companies have been identified. The first encompasses Case Companies C, D, E, and H. The second consists of Case Companies F, G, I, and J. Interestingly, these two groups are, with the exception of Case Company I, also those that either emphasize the importance of accessing existing technologies or not. The following discussion therefore highlights what exactly distinguishes these two groups. Also the special position of Case Company I, for which this clear overlap between the benefits and management mechanisms cannot be achieved, is discussed.

Distinguishing Different Partnership Models. Two groups have been identified that share a lot of common characteristics with regard to the six developed propositions. The first group consists of Case Companies C, D, E, and H. In a nutshell, these companies are interested in accessing the existing technological base, they see a certain danger in standardization, they do not feel that monitoring the hub is of prime importance, and they do not see any downsides of managing their partnership through personal ties. The second group consists of Case Companies F, G, and J. In contrast to the first group, these companies do not see accessing technology as key benefit, they do not feel that standards are threatening their business, they feel that missing monitoring of the hub is deteriorating their relationship, and they are not entirely happy with managing the relationship through personal ties. Why do these differences exist between these two groups? In the following, first a distinction is drawn between the two above identified groups of spoke case companies. Then, the different results for the six developed propositions are explained in the light of this distinction. Finally, Case Company I is described in more detail, as this company seems to fall somewhat 'in the middle' of the two groups.

The underlying explanation for this sharp distinction between the two groups can be found in what kind of solutions the spoke partners are actually developing. For the first group, the developed solutions are mainly offering integration functionalities with other systems. The solutions of Case Company C are integrating vending machines or intelligent refrigerators with the system of Case Company A. Case Company D is developing integration interfaces between the system of Case Company A and the CAD suite of their other big partner. Case Company E is focusing on the integration between Case Company A's system and a specific groupware system[18]. Case Company H is offering data archiving solutions. Key to these solutions is the integration between Case

[18] Through their engineering departments, Case Company E is also offering other solutions. However, the partnership to Case Company A is not in the focus of these engineering departments. Therefore, the focus is on the business software department.

Company A's system and the storage solutions offered by other partners. Thus, the integration between Case Company A's system and the system of another partner is key to the business models of these companies.

While the other group of case companies also integrates their solution with the System of Case Company A (otherwise they would not need to partner at all), this integration is not a crucial part of their business model. Rather, they see the added value of their solution in the business functionality that is covered by this solution, and not simply in the technical integration. Accessing this added value is facilitated through the integration with Case Company A's system, yet the added value is not *restricted* to the integration in itself. Case Company F for example develops a solution for automatic, mobile data recording. For example the voice controlled warehousing system allows for a more efficient inventory handling, even if it is not integrated with Case Company A's system. However, this integration does indeed further enhance the efficiency of the inventory handling process, as the recorded information otherwise would have to be transferred manually. The same is true for Case Company G's solutions that are specified on managing advertisement or on transforming printed newspapers into online presences. These solutions offer an added value for newspaper publishing companies even without integration with Case Company A's system. However, here again, the integration of for example advertisement data directly into the standard business applications of Case Company A facilitates the usage of these solutions. The same story can be told for the Product Information Management solution of Case Company J. All these would be valuable for customers as stand alone software. However, the integration with large enterprise IS, like those of Case Company A, facilitates their usage and thus makes the solution even more attractive for customers that already use this large enterprise IS. Thus, it can be assumed that the importance that this business functionality plays in comparison to the technical integration features is key for distinguishing the two identified groups. Figure 4.10 illustrates the importance of this business functionality for the different solutions of the eight case companies[19].

Based on this assumption, also the differences with regard to the six theoretically proposed benefits and management mechanisms can be explained. First, the difference in the perception of accessing existing technology can be explained through the fact that for the group of case companies that is offering technical integration services, obviously this aspect is of prime importance. Thus, Case Companies C, D, E, and H see this aspect as a key benefit for their partnership with Case Company A. In contrast to this, the interviewees of the other group (Case Companies F, G, and J) to a large extent not even mention the access to existing technology of Case Company A.

The difference in the perception of standardization can be explained in a similar vein. The focus of the first group's business model is on technical integration of Case Company A's system with the systems of other vendors. As it is the business model of

[19] This is the author's perception. There has been no quantifiable measurement of the *importance of business functionality* included in a solution.

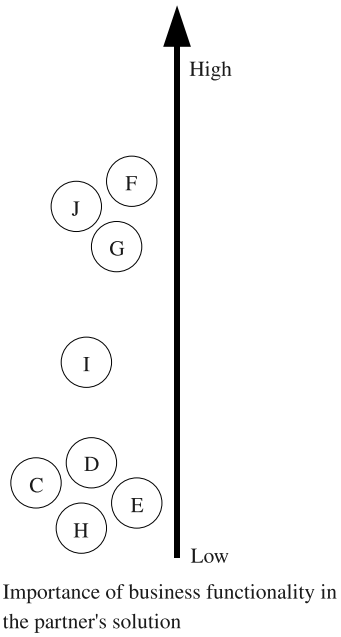

Figure 4.10: Degree of Domain Knowledge in the Partner's Solution.
Source: Own Illustration.

these companies to integrate these systems, they would loose a significant revenue source if this integration could be achieved on the basis of standardized, open interfaces. Again the contrast is true for the second group. This is also no surprise, as the solutions that are offered by these companies are an inherent added value. The easier the integration can be achieved, the easier it is for those companies to convince customers that they should utilize their solution. In this context standardized, open technologies would improve the market prospects of these solutions.

Finally, the difference in monitoring and personal relationships can be explained by the fact that the first group is acting in a more stable environment. The existing integration solutions are offered on a continuous basis, while the domain solutions might be subject to integration efforts from Case Company A. Thus, for the first group, monitoring the large partner is not seen as necessary, and personal relationships are a good enough management mechanism. The contrast is true for the second group, which sees better knowledge about the large partner as necessary and personal relationships as an insufficient substitute for this more sophisticated monitoring. This aspect is yet very fuzzy. It is therefore further dwelled upon in Section 4.3.2, which covers differences between the two groups in the transition from one partnership process to another.

The final aspect that has to be discussed here is the special role that Case Company I is playing. This company does not neatly fit into one of the two categories. This case seems to be part of one group with regard to the benefits, yet part of the other with

regard to management mechanisms. The underlying explanation for this is the changing business that Case Company I is in. Its traditional line of business has been printing solutions, which clearly belongs into the group of technical integration solutions. In this context, the company sees accessing the existing technology base as being of prime importance. However, with the uprising of sophisticated electronic document handling processes, this is currently changing. As it has been mentioned in the case narrative, recently, aspects like digital signatures have emerged. Consequently, a growing fraction of the case company's business is consulting in this area, rather than technical solutions. For this reason, the company is growing into more domain knowledge intense business areas. Thus, technical integration is still a large source of revenues, and consequently accessing existing technology is seen as key benefit for this aspect. However, at the same time, missing monitoring and the reliance on unpredictable personal relationships as substitute for this, are taking their toll on the consulting business. Case Company I is therefore pictured as being in a transitional phase between the two groups in Figure 4.10.

4.3 Network Analysis

After the preceding two parts of the case analysis have been addressing first, specifically the hub cases and second, specifically the spoke cases, the present, concluding part integrates both perspectives into one comprehensive picture. The context of this analysis is the partner network of Case Company A, because the spoke cases have been selected from this partner network. The following discussion is to a large extent based on the single process matrix that is illustrated in Figure 4.3, and on the perception that multiple passages through this process might be required, depending on the type of solution (see Figure 4.4). Thus, first a discussion sheds more light on how the network partners perceive their passage through this process matrix. Then, the following discussion illuminates how the transition from one process matrix to the next is perceived in the network.

4.3.1 The Partnership Process from both Perspectives

As it has been discussed, both for the hub and the spoke organizations, the accessing of new markets can be considered the driving force behind the decision to participate in an inter-organizational IS development network. Thus, indeed reaching the very right-hand side of Figure 4.3 is the targeted goal for both partners in the network. There is also no divergence between the hubs and spokes, from where a spoke partner is supposed to start its passage through this matrix. The discussion of the spoke cases above has given clear evidence that all analyzed spokes in unison argued that standardized technologies are important for developing a solution in the context of the hub's system. Thus, the first step in the partnership process is, just as this has been illustrated in Figure 4.3,

the development of an innovative solution on the basis of open standards. The result of this first step is a solution that is integrated with the hub's system. At this stage, the development can potentially be achieved without awareness of the hub[20].

Once this stage is reached, the decision has to be made whether this solution is supposed to be certified by Case Company A[21]. Here, open standards play a pivotal role in that they would potentially enable a spoke to go to market without certifying the developed solution. Going this way has not been done by any of the analyzed case companies[22]. However, the interviewee in Case Company I has mentioned that many of this company's competitors are actually going this way. A potential reason for this has also been mentioned during the interviews. Especially for Case Company J, the concern has been raised that the certification process might lead to a substantial drainage of knowledge towards Case Company A.

However, in all of the analyzed spoke cases, the certification process has been considered to be of prime importance for the successful management of the relationship. Again, a potential rationale for this has been given in the interviews. One of the key benefits for partnering with larger system vendors has been the signaling that the existence of the smaller spoke is not threatened. This benefit is only achievable if the relationship is official, and the large, well established hub company has signaled exactly this through the certification. This aspect has again been mentioned by Case Company J as key reason for conducting the certification.

So far, the 'ideal' partnership process has been identical form both the hub's and the spokes' perspective on their network activities. The reason for that can be found in the fact that the process so far is neither very expensive for the hub, nor for the spokes. That the hub sees the certification process as the lowest level of a partnership, and that Case Company A therefore deliberately keeps the necessary expenses for partners in this process low, has been discussed in Section 4.1.1.5. This perception is shared by the spokes, which also do not consider the certification process as very costly or requiring a lot of effort. Answering the question of how much effort they put into the certification process, all interviewees answered comparable to the two exemplary quotes shown below.

> The effort is manageable. It's definitely below a level where we would have said we need to push ourselves to reach this certification. It's a reasonable effort. This especially because the certification is a re-occurring event. For

[20] This is somewhat different in Case Company B. Here especially through the status of an uncertified network *member*, the hub is able to gain considerable insights in who is part of this company's network.

[21] Again this is slightly different for Case Company B. Here, certifications of employees, not of solutions, are only one aspect of reaching the middle layer. Also a successful customer project is needed as a reference. This obviously makes this process more complex, yet the signaling effect that's discussed below even stronger.

[22] Indeed, it has been one of the selection criteria for the spoke case companies that they are officially part of Case Company A's partner network. This can only be achieved by going through the certification process for at least one product.

> the first time, the effort has for sure been higher. Simply because you had to become acquainted with how the process works. If that comes up periodically, it's more routine work. The effort is relatively low, it's within a reasonable scope. (Interviewee H1)
>
> The effort for the certification has been relatively low. Case Company A itself has helped us very much, because they had a strategic interest in our solution. The certification itself has a certain price. However, whenever there's something starting new at Case Company A, there are lots of discounts involved. If you're clever in using these discounts, the certification is manageable even for very small companies. That's not a huge burden. I can also understand very well that Case Company A is charging for the certification process. Otherwise everyone would certify his solution just for the fun of it. (Interviewee J2)

However, after this common denominator how the partnership process starts, it has to be mentioned that indeed both partner categories are striving for very different layers in the process matrix when it comes to market access. While Case Company A has considerable incentives to force partners to stay on a middle layer trajectory, the spokes attempt to reach the highest level. This is illustrated in Figure 4.11.

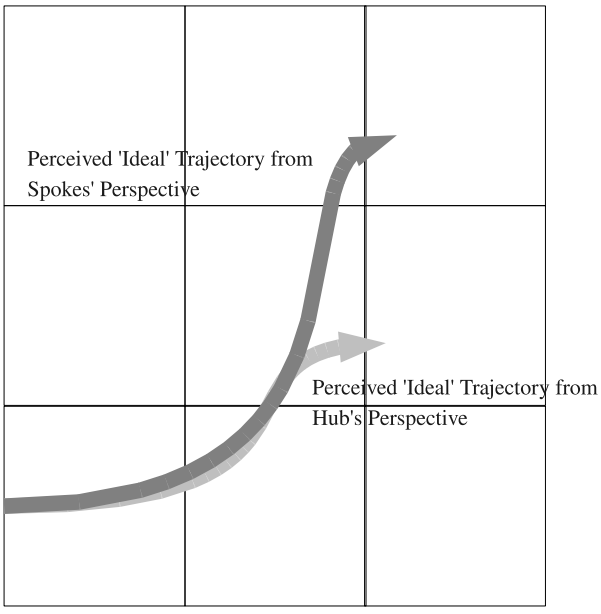

Figure 4.11: The Perceived 'Ideal' Trajectories from the Hub's and Spokes Perspective. Source: Own Illustration.

For this difference in perceived ideal trajectories, ample support exists in the collected data. First, the following quotes from the spokes' perspective illustrate the fact that this partner group is striving for a very high intensity in joint market accessing:

> The next step of the partnership that would be interesting for us would be to get our solution on the price list of Case Company A. Before that, there is actually another step, a joint sales agreement. I would frame it like this, we're selling together and share the revenues. (...) The price list is for sure an interesting topic, simply because we have the sales force of Case Company A working with our solution, that would be thrilling for us. (Interviewee C1)
>
> What I'm wishing for is more support in joint sales. In this regard, we could achieve more than we're currently doing. We have many international inquiries, which we cannot satisfy because we are not present in the different locations. We're simply too small to have subsidiaries in all different countries. So, a more intense cooperation in sales would be desirable. (Interviewee E1)
>
> Our desire is very clear. The ideal situation would be, if we would provide the Cross Media Publishing solution of choice for Case Company A. In this context we're exclusively recommended by Case Company A, we're on the price list of Case Company A, or we're even an integral part of Case Company A's system and they are paying license fees for our solution. That would be ideal. (Interviewee J2)

Thus, while it can be argued that most of the spoke partners are attempting to reach those higher levels of partnership, Case Company A is actively attempting to limit the number of partners on those levels[23]. This has been very well described in Section 4.1.1.5. The rationale behind this difference in perception of hubs and spokes is very evident if their roles in the network are considered. For the spokes, experience has shown that close personal ties are key for managing their relationship with the hub successfully. Thus, they are striving for a position in the network, which allows them to gain access to these close personal ties. This is, as the discussion of the hub perspective on the network has shown, especially the case for those solutions that reach this 'highest level' of partnership. However, this clearly contradicts the goals that have been raised from Case Company A's perspective, namely to make the partnership process *scalable*. Basing the partnership on close personal ties essentially achieves exactly the opposite of a scalable process, as these personal relationships are the most expensive management mechanism that can be employed in this context. Interviewee A11 has realized this very well.

[23] Here Case Company A and B are indeed very similar. Both have severe restrictions concerning the access to their highest partner category. Case Company B mentions that, similar to Case Company A, these partners have to achieve first of all a certain score with regard to certified employees and successful customer projects. But even then access is only 'by invitation' (see Section 4.1.2.4)

> For certain tasks in technical enablement, we have a senior engineer working with a partner to identify issues in integrating their solution with our platform and that takes a lot of time and it takes valuable resources. And that's a very expensive way to do technical enablement. (Interviewee A11)

Thus, the underlying reasons for these diverging ideal trajectories can be considered the one-to-many nature of the relationship. Most spokes are only partnering with one or at most a couple of partners. Thus, for them it is easy to manage these relationships through personal ties. However, as the hub organization has a relationship with all of the spokes, potentially thousands of them, it is very cost prohibitive for this hub to manage each relationship through close personal ties. This contradicting perception is well supported in the interview data.

> It is important to recognize that our partners do not have that many solutions. In an extreme case this is a 1:n relationship. The partner has one solution which he wants to sell, and he's now talking to Case Company A, which has n solutions. For them, the partner solution is simply one solution among many, many more. So, the penetration of Case Company A's sales organization is not really an easy task. This is a potential source for conflicts, if the partner calls us every four weeks and asks why we have not generated any sales leads for him. For us, the ideal model is, if the partners bring their own business. (Interviewee A6)

Thus, Case Company A has to have some selection criteria in place that determine how far a partner can rise towards this rightmost third of the partnership process matrix. It can be argued that the dominating decision criterion is indeed the importance of the business functionality that the partner solution is containing[24]. Thus, through laying Figures 4.10 and 4.11 on top of each other, the different partner paths can be explained. This is illustrated in Figure 4.12.

In the collected data of the various spoke cases, indeed support for both of these partnership models can be found. The first quote illustrates a case that is located more in the top-most square. In this example close personal interaction between the hub and the spoke is necessary, due to the critical business functionality that the spoke brings into the relationship. The latter quote illustrates a case more in the lower area of the matrix. Here, no close personal relationships are required, both hub and spoke act very independent from each other.

> There is always a central project owner who is located directly at the customer. I'll give you an example. We are currently working on a project that Case Company A has with a Danish newspaper cooperation. That is

[24] In the context of Case Company A this also means that these solutions are supplementary to the platform. Whether this would be different for Case Company B could not be determined from the here collected data.

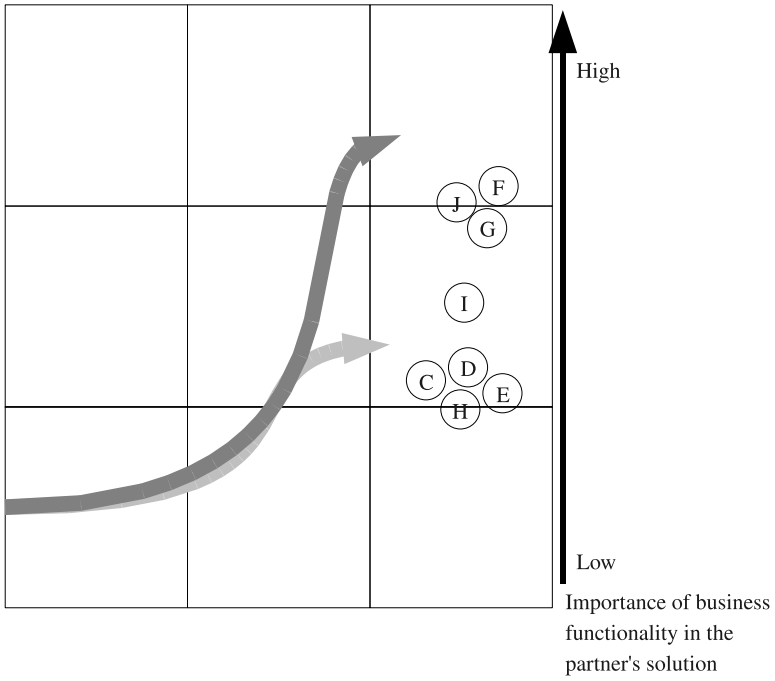

Figure 4.12: Partner Trajectories and the Business Knowledge in their Solutions. Source: Own Illustration.

> centrally coordinated by the Danish subsidiary of Case Company A. We are participating in this project through several of our employees that are permanently working in Denmark, either as consultant or developers. But the leadership is clearly assigned to Case Company A and its Danish subsidiary. (Interviewee G1)
>
> Currently we are having a case that is very interesting. We have installed our solution for collecting data from vending machines at a customer. For this customer, our solution has triggered the consideration to use the system of Case Company A. We're turning the tables here, that is very interesting. (Interviewee C1)

Each quote represents the 'ideal' case of a partnership, at least from the perspective of Case Company A[25]. The Danish newspaper project can be assumed to rely heavily on the domain knowledge that Case Company G is bringing into the project. Consequently, the joint go-to market is very intense in this example. This type of project can only be successfully addressed through such a joint approach. In contrast this joint approach is not necessary in the second example. Rather, the partner's solution that has been

[25] As it has been discussed in Section 4.1.2.6, this is also perceived to be the ideal case for Case Company B.

integrated into the overall solutions portfolio triggered additional revenues for Case Company A without necessary generating additional effort. However, the empirical data that has been collected in the spoke cases indicates that Case Company A is still far away from this ideal model in most of the cases. Indeed, it is not only true that most spoke partners strive for reaching the highest partner categories, but also that even the middle one is dominated by personal relationships as the most used management mechanism. Thus, one of the key challenges for Case Company A is indeed to develop formalized tools, methods, and procedures that allow it to manage the joint market accessing with certified partners in a cost minimizing way. This has also been highlighted in various interviews in Case Company A.

4.3.2 The Transition between Cycles

Besides the question of how the spokes traverse through the process from innovation over integration to market access, another issue that emerged as being of prime importance is the fact that this process is a cyclical one. Indeed, often spokes do not pass through this process once and then reach a steady state. Rather, they are engaged in a constant struggle for outspeeding the developments of both the hub and other, competing spokes. Commonly this happens through developing their own solution further, so that ideally a new innovation is emerging in the IS development network. Obviously this is very well in the interest of the hub, as it has been discussed in the concluding paragraph of the key benefits of Case Company A, in which the cyclical partnership process has been developed (see Section 4.1.1.2). However, as this has been a perspective that has been singularly coined by the perceptions of Case Company A, the present discussion is again intended to highlight the comprehensive picture, which also includes the spokes' perspective.

In this context it has been argued that indeed two potential paths exist for spoke companies (see Figure 4.4). The first is that which has been proposed for technical or niche functionalities. The main idea behind these solutions has been that Case Company A deliberately has decided not to offer solutions in this context, they are considered as non-core[26]. As a result, these smaller partners do not have to fear that their solution is becoming integrated into the overall system of Case Company A. This does not necessarily mean that partners do not have to innovate their solutions. However, their key rationale of why innovation is necessary is more motivated from an industry competition perspective. Obviously, IS are subject to constant innovation, so the partner's competitors are also further developing their solution and a stagnancy in this development naturally leads to a decline in the partner's business, without any action of Case Company A. The fact that this is an issue has already been well described by the in-

[26] This is also the reason, why the environment of case companies that act in this role has been described as being more stable above.

creasing scope of Case Company A's standardized interfaces that has been perceived as threatening to some of the spoke companies. A historic example for this kind of development has been mentioned by the interviewee in Case Company H.

> A good example is the transition from mainframes to client-server architectures. In this context we had to precisely define where we're setting our focus. It has been clear that our mainframe business has been declining strongly and we had to substitute these revenues in the client-server environment. We have offered a solution that has been an enhancement of our mainframe solution. That has been a clear continuing of our strategy. Similar events might happen in the future, there are always dynamics in this business. But I'm confident that we'll master any challenges. (Interviewee H1)

Thus, albeit enhancements to Case Company A's system had an impact on the solution of Case Company H, this impact has not been a deliberate attempt to integrate the functionality of this solution into the system. Rather, the progression of the system has rendered parts of the solution obsolete. However, as Case Company H has been flexible enough to adjust its business model, they have been able to successfully continue the relationship. The reason why Case Company A has decided against addressing this specific niche solution has been also given by Interviewee H1. Interestingly, this quote sounds like a brief summary of the developed theoretical propositions, why partnering between large system vendors and small software developers promises to be especially fruitful. While the fact that this decision is not necessarily a stable one has also be recognized, this is a risk that the partners of Case Company A have to live with.

> Case Company A is for sure considering that we are relatively far in this specific aspect. They would have to catch up with our years of experience, they have to build this from scratch so that this is not worth the effort. This probably also, because they have much more distributed development teams. We, as a small company do have the advantage that we can react very flexible to requirements. This is simply not possible to this extent in a large company like Case Company A. For us, different development paths that are addressed by different teams are much easier to coordinate than for a large company. So this is difficult to tell. (Interviewee H1)

> Especially in our business, Case Company A has initiated developments in the past that have led some of our customers to question whether there's still need for our add-ons. We have been hard pressed to explain what the added value of our solution exactly is. For sure it is a very substantial risk that Case Company A is offering a comprehensive solution that would make ours obsolete. We would instantly feel that in our business. That's one of the risks involved for us. (Interviewee H1)

So, this type of complementary relationship between Case Company A and providers of infrastructure solutions ceases to exist only if the partner is not able to live up to the average rate of innovativeness in the industry. However, there are also those relationships in which the existing functionalities of a partner are considered to be standardizable business applications by Case Company A. For these, a different development has been proposed, that of a transition from one partnership process to another. This because Case Company A reserves the right to develop own solutions or even buy the partner company in order to integrate the solution into their existing system. There has also been an exemplary case for this scenario among the eight spoke companies. Case Company J is currently facing a situation in which their larger partner has acquired a company that is offering a solution which has a very similar functionality to what Case Company J is offering. As this has happened only very recently, the situation is not yet clearly understood by all the stakeholders. As Interviewee J2 comments:

> An important factor in our current partnership is the fact that Case Company A has acquired a company that is offering a solution that is addressing our niche. So through this acquisition Case Company A has an - albeit inferior - solution and they cannot just throw that away. So we're now facing an unattractive situation which is not yet completely understood by the market. In some aspects we're now competitor, in others we're still cooperating. That is making the forging of a strategic alliance in which markets are jointly addressed very, very difficult. Actually that is a real show-stopper, we're currently on hold, we're waiting... (Interviewee J2)

This situation of existing overlap is in itself not considered to be extremely harmful for the relationship between the two companies. Rather, it is recognized that a certain overlap between the solutions of the involved parties is unavoidable, and that this overlap is not even considered to be critical - as long as the overlap does not concern aspects of Case Company A's system that are considered critical by this organization.

> There's always a certain degree of overlap. With such a large partner, who has such a diverse solution portfolio it is impossible to avoid overlaps altogether. What counts, however, is to limit these overlaps to certain, well restricted areas. A complete overlap has to be avoided. (Interviewee J2)

> In the end, there are always opportunities for cooperation. If there is a certain overlap, this functionality can be excluded from the partnership. You can always find a solution if you're aware of the problem before it escalates. One limitation to this are areas that Case Company A considers to be part of the strategic core of their system. If there is any overlap, you're excluded from the partner network at lightning speed. They can't take a joke there. (Interviewee J2)

However, as Case Company A has acquired a company that is offering a solution that is very similar to that of Case Company J, it might very well be the case that Case Company A now perceives this newly acquired solution as belonging to the strategic core of its system. Yet, as this decision does not seem to be made, Case Company J is obviously not completely inactive. Rather, its executives are working heavily at influencing Case Company A into not developing their newly acquired solution any further. Again, the mechanism of choice for this endeavor are the personal ties that exist between the two companies.

> How this thing develops is currently completely open. It depends on the decision of Case Company A, whether they want to expand this solution into a full-fledged product; or whether they discontinue the development over the medium term and push our solution. An important aspect of this is the fact that this decision involves many different people in Case Company A and that these people do have different opinions on the issue. (Interviewee J2)

It is also clear for Case Company J that the partnership can indeed be terminated if this decision is not made in their favor. If Case Company J is unable to find a new innovation that can again be integrated with the system of Case Company A - and at least in the interviews none has been mentioned - the decision would indeed be to terminate the partnership with this hub organization, and perhaps find another partner that does not have the specific functionalities that Case Company J's solution is offering in his portfolio.

> We would favor Case Company A, simply because we know them very well. Our principal shareholder has worked for them many, many years. It would be a real personal problem for him, if the partnership would be terminated. It is very clear for us, that a partnership with a business application vendor is very important. We would favor Case Company A. But if they tell us that they have their own product and that we're competitors from now on, we have to go to another partner. With a heavy heart, but that's how it is. (Interviewee J2)

> Of course we have contacts to other vendors as well. We know the people who are responsible for strategic partnerships in these companies. As I have mentioned, our relationship to Case Company A is currently slowing down, so we have to consider alternatives. Case Company A is our favorite partner, and we are investing heavily into this relationship. But in case that we don't see progress in the relationship, we have to cooperate with others. There are a couple of companies that are very, very interested in working with us, because they do have a gap in that functionality. (Interviewee J2)

Thus, summing up the discussion on the dynamics within this inter-organizational network, it can be argued that IS development is a fickle business. While some partnerships are designed to last for a long time, most of the attractive partnerships are subject to complete makeovers due to the inherent dynamics in the industry. Thus, analyzing these dynamic relationships can indeed be considered as a key challenge of IS research. In this regard, the present study can only be seen as a first step in an ongoing process. The next and final chapter summarizes the study's main findings, discusses its implication both on theory and practice, and illuminates potential paths for further research.

5 Discussion and Conclusion

5.1 Summary

The IS development industry is currently undergoing a fundamental change towards a more inter-organizationally structured development approach. While this *industrialized* approach has been adopted by many other engineering disciplines, it has so far not been successful in the field of IS development. Recently this seems to change with the wide adoption of SOA principles. However, while this change is currently happening in the industry, IS research has so far not addressed its underlying rationales. This work has been conducted in order to fill this gap. In this context very fundamental research objectives have been stated at the outset of this study. The first has been the answering of the question why organizations in this industry are adopting this - albeit only for their industry - novel approach. Parallel to this first research objective, the second research objective has been the addressing of the closely connected question of how this newly emerging industry structure can be managed by the organizations that are part of it. Finally the third research objective has been the integration of the two preceding ones into one comprehensive model of fruitful partner relationships and their management.

There is a key rationale why this structure has been developing only during the last couple of years in the IS development industry. There are specific idiosyncrasies of this industry that have impaired the emergence of this structure in this industry so far. It has been argued in the fundamental part of this work that the fact that IS have to be considered as *information* and *intellectual* goods has so far breeded an integrated approach that has dominated the industry throughout the last decades of the twentieth century. In contrast to this integrated approach, many other industries have adopted an inter-organizational network structure. This approach has also been further analyzed in the foundational part of this work. The preliminary result of this analysis has been the clear understanding, that the structure within the IS industry is not undergoing a *revolutionary* change. Rather, today's dominating firms are going to develop into *hubs* of a network of hundreds or even thousands of smaller partners (*spokes*). Consequently, these two broad categories of companies are also selected as the two main subjects of the empirical data analysis. This decision is rooted in the choice of change perspective. It has been argued that indeed the overarching goal of this work is the explanation of changes in industry structure - which could be achieved through a *dialectical* perspective of conflicting development paradigms. However, as it has also been noted, these development paradigms have to be filled by individual organizations. Thus, the more appropriate perspective for this work is the *teleological* one, attempting to answer questions as those stated above for individual companies.

Thus, as a next step the answering of the first two research objectives is prepared through a comprehensive discussion of the relevant theories. For answering the question, why organizations are adopting this approach, a strategic perspective has been chosen. As the context of this study is limited to the IS development industry, the guiding theory necessarily had to address differences between the organizations in this industry for explaining their behavior. The resource based view and its enhancements have been selected as they are the dominating theory in this context. The idea behind the inter-organizational application of this theory is that those companies that possess resources that others do not posses are attractive for partnering. Thus, this first theoretical part has focused on finding what resources or capabilities a company can potentially possess that make it an attractive partner. Three of these have been identified: the capability to innovative, the availability of complementary or supplementary technologies, or the capability to access novel markets. As this study is approaching the network from a hub and a spoke perspective, all three have been adapted to the specific context. So, the hubs' innovativeness if focused on architectural innovations, while the spokes are supposed to focus on modular innovations. The hubs' technology is that of an existing platform of basic functionalities, while the spokes focus on niche functionalities. The hubs' market access is granted through their reputation and their already existing customer base, while the spokes are assumed to be more flexible and agile in responding to customer needs. These ideas have been phrased as a first set of propositions to guide the empirical study.

The second research objective has been approached through a discussion of management mechanisms that can be applied by the organizations in the IS development industry. The theoretical foundation of this discussion has been the recognition that two problems emerge in the inter-organizational context much stronger than in an intra-organizational one. First, behavioral issues have to be addressed. The combination of bounded rationality and opportunistic behavior results in difficulties to control the partners. Three theories have been discussed, and each of them has yielded a (dominant) perspective. First, assets should be standardized. Second, transparency in the relationship should be increased. Third, the relationship should be designed to be of long-lasting nature, which is commonly achieved through close personal ties. All three aspects minimize the possibility of and the incentives for opportunistic behavior. The second perspective has been that of coordination of complex interactions. This can be achieved through three distinct means: The reliance on standardized processes or technologies, the controlling or monitoring of interacting parties, and finally, close personal interactions between the parties. Obviously, the two distinct paths have led to very closely related mechanisms. These promise to be those that are applied by companies interacting in inter-organizational cooperations. So, it has been argued that both hubs and spokes use them in their relationship management. Again, these have been phrased as a second set of propositions.

These two sets of propositions are used to guide the empirical part of this study. As research is scant in this area, the propositions have explicitly not been phrased as clear-cut, sharp hypotheses. This indicates that this study is more *exploratory* in nature, meaning that it is considered to be only a first step in shedding more light on the issues discussed above. Consequently, from a discussion of different research strategies in the third chapter, the methodology of exploratory case studies is selected. Some of the specificities of this research methodology are also discussed in this chapter. Here especially the already mentioned exploratory nature is important, as is the closely related *qualitative* background of this study. Also, as no long-term analysis has been feasible, the study has been designed as a *variance theoretical* approach. Furthermore, the *replication logic* of this study has been discussed. As literature on this research approach commonly suggests both *literal* and *theoretical* replication, the cases selected have been two hub organizations (literal replication) and eight spoke cases (theoretical replication). Finally, the applied processes of data collection and analysis have been introduced.

In the fourth chapter, these ten cases have been analyzed in a three-staged process. As a first step the individual cases have been analyzed with disregard to the other cases. Then, the two categories of cases - hubs and spokes - have been analyzed with disregard to the other group of cases. Only in a final step, both categories have been integrated into a holistic analysis of the entire IS development network. The rationale why the hub cases have been analyzed first, is that it has been argued that they have been and still are playing a dominate role in the industry.

5.2 Discussion of the Findings

As a very fundamental first step the fact has to be recognized that indeed hubs and spokes partner with each other because of capabilities or resources that the other possesses but oneself is lacking. To which extent these are the ones that have been developed in the theoretical part of this study is subsequently discussed, first from the hubs' and then from the spokes' perspective.

5.2.1 From the Hubs' Perspective

Concerning the first research question, indeed all three aspects are considered to be of prime relevance by both case companies. The fact that usually smaller spoke partners are more flexible and agile in reacting to novel environments has been mentioned by various interviewees. As it has been theoretically proposed, this innovativeness is twofold. First, specific innovative solutions can be developed faster by the spokes. The main reason the hubs see for this has been found in the lean organization of these companies. Second, the spokes are also able to bring innovations faster to the customer. Here especially the close proximity between spokes and customers has been mentioned as a key advantage that the spokes possess. Also, the proposition that spoke partners provide complementary niche

functionalities has been very well supported. Especially those functionalities that are beyond the scope of the hubs' core activities or those that are addressing a very narrow market are in the primary focus of the hubs. However, the proposition that hubs also partner with those organizations that develop functionalities that supplement those of the hubs has only partially been supported. If customers explicitly ask for those partners' solutions the hubs do partner with them, but reluctantly. Especially the timeframe of these partnerships promises to be rather limited. This asking of customers for a specific solution has already hinted upon the last aspect that has been theoretically proposed as key benefit: The access to novel markets. Indeed, very good support has been found for this proposition. It can be argued that the hubs see this as the dominating reason why they partner. As spokes are very close to their specific customers, hubs are able to gain access to these markets through partnering with them. Thus, all the propositions why hubs partner with spokes have been supported.

However, what has also been shown in this data analysis is the fact that the three proposed benefits are not independent of each other. Rather, complex temporal dynamics exists between them. Thus, the initially devised variance theoretical approach had to be abandoned, and a process perspective had to be used to explain these dynamics. The process of partner relations that has been identified starts with an innovative solution of a partner. Then, the technical functionality that is the result of this innovation is technically integrated into the portfolio of the hub. As a final step, a package consisting of the partner's solution and the hub's platform is brought to market, either by the hub, by the spoke, by a third party, or by any combination of the three. This process has been described in close to identical terms for both hub case companies. It is thus reasonable to assume that indeed such a process is of general relevance for all hub companies in this industry. However, what has also been mentioned for both cases is that fact that once this process has been traversed, the relationship between the involved parties is not a stable one. Rather, the dynamics in the industry render such a stable balance impossible. Always looking for ways to augment the functionalities of their platform, hubs have a veritable interest in completely integrating the partners' solutions - either through acquisition or through imitation.

The partnership process is thus a cyclical one. Once the partners' solution has been identified as target for absorption by one of the hubs, it is the most common way for these partners to develop a novel innovation, which makes the process start anew. This cyclical nature of the partnership process also clearly supports the idea of IS as *intellectual* goods. As it has been argued, the functionalities of these goods are not limited by their physical aspects. Rather, IS are constantly applied to novel contexts by their users and their developers. Therefore, they are subject to continuous innovation. This fact gives spoke companies, which interact much closer with their customers than large hub organization, the opportunity to constantly outspeed their partner. They are thus not only ensuring their own survival in the networked IS development industry, but also realizing the endless innovation proposed by (Lee, 1999).

In this context, also the above mentioned partial support for the proposition on supplementary technologies is playing an important role. For both case companies only those supplementary solutions have been considered as running an increased risk of being absorbed into the platform. Thus, absorption is only considered to be a feasible option for those partners that act on the same layer of the horizontally organized industry stack as the hub. Contrary to this, for adjacent levels of this stack, hubs are attempting to support a multitude of partner solutions in long-lasting relationships. These hubs are therefore following a twofold strategy to, first, increase the role of their solution as a bottleneck in the stack, and second, to decrease the role of the solutions of partners on different layers of the stack. This has been shown very well in the present study, as both case companies consider adjacent levels as their core business. Thus, both hubs are, in certain areas, engaged in intense partnering with each other, yet they are also fierce competitors in other areas.

Analyzing the second research objective from the hubs perspective yields similar results. Both case companies rely on standardizing both technologies and information for their partners. Indeed, as it has been theoretically proposed, this is the fact because standardization is a very scalable process. Once the standard has been defined, additional partners can be managed at almost no costs. However, in which both hubs differ is how access to these standardized technologies and information is governed. The access seems to be simpler for partners of Case Company B, here only a signing up at the partner portal is required in order to get the most basic access. In contrast, Case Company A only officially recognizes a partner once he has certified his solution. Before that partners are not even considers as that. This leads over to the second proposed management mechanism, monitoring. Also, monitoring the partners is applied by both hub organizations. However, again slight differences exist in how this is achieved. As it has been mentioned above, officially becoming partner of Case Company A is achieved through certifying the inter-operability of a spokes solution with the hubs platform. Certification of spoke employees is possible, yet it is not perceived to play such a dominant role. In contrast, officially becoming partner of Case Company B is achieved through certifying a certain number of employees and producing a customer show-case. Thus, while the initial access to the partner network seems to be less restricted in Case Company B, the official recognition as a partner seems to be more restricted. This is well in line with the theoretically discussed aspect of certification as a substitute for a direct quality assessment. For the last proposed management mechanism, dedicated personal relationships, both hubs are close to identical to each other. Only a highly restricted number of partners is managed mainly through this mechanism. This well reflects the theoretical considerations that this mechanism is perceived to be the most expensive one. Thus, the findings of this analysis are highly similar for the two hubs. They can therefore also be assumed to have high validity for other hub organizations as well.

However, similar to the partnership process described above, also these three mechanisms are not independent of each other. Rather, an incremental approach to managing the relationship is taken by the hubs. The first step in this incremental approach is

considered to be the development of a specific solution by the spokes. This first step is not intensely supported by the hubs. In both cases, the above mentioned standardized technologies information flows have been the only touch point between the hubs and this (early) spokes. This changes, once the solution is actually perceived as being connected to the hub by the customers. Then, both hubs engage in close monitoring of both the spokes' employees and their solutions through the above described certification processes. Such an affiliated addressing of markets is only considered by hubs, if they are convinced of the quality of their partner. Then, in a final step, some very carefully selected partners are promoted to the top-most level of partnerships. These partners are actively assisted by the hub through a dedicated personal support. Also, these top-most partner category is in part recommended to customers by the hubs, or even sold as integral part of the hub's platform. This incremental approach is well explained through the fact that the hubs are engage in a one-to-many relationship with spokes. Standardized technologies and information flows are highly scalable. The marginal costs of adding one partner are close to zero. This changes with the monitoring of partners. The marginal costs of this process can be considered as being of multitudes higher than that of standardization. Finally, the dedicated support through personal contacts can be assumed to be the most expensive type of relationship management mechanism. Thus, this mechanism is limited only to the most important or promising partners.

Combining the findings of the two above described threads of this study can be used to answer the third research objective. The questions in this context have been whether differences in partner categories exist, whether these are managed through different mechanisms, and whether there is a *fit* between the two. Actually all three questions can be answered positively. Indeed, different partner categories exist. This albeit the fact that they are, contrary to what has been initially assumed, not based on the three benefit categories. Rather, the dominating benefit in the partnership process has been the addressing of novel markets and therewith the generation of additional revenues. Thus, partner categories exist, depending on the potential that the partner has for this revenue generation. These different partner categories are indeed managed through different mechanisms as it has been described above. Finally, there is a fit between the two in that partners are receiving a more intense treatment if they have a higher potential.

5.2.2 From the Spokes' Perspective

Parallel to the analysis of hub companies, also spokes have been analyzed. In the context of benefits derived from the relationship to the hub, the propositions are not as clearly supported. Architectural innovativeness of the hubs is considered to either be of no importance at all, or even to be a disadvantage of the relationship. This clearly rejects the proposed positive benefits of this aspect. A reason for this can be found in the fact that smaller spokes feel that their position in the network might be threatened through architectural innovations. The availability of a broadly established technical platform

has been the second proposed benefit for spokes in their relationship to the hub. This benefit, however, is also not clearly supported, as it is only recognized by some of the spoke partners. The others do not feel that accessing the existing technology of the hub is a key benefit for their relationship. In contrast to the first two propositions, the final one is clearly supported. The market access that the hubs offer is of dominating importance for all of the spokes. As it has been theoretically proposed this aspect consists of two parts: First, the fact that most customers of the spokes are also customers of the hubs, so that seamlessly integrating their solutions is often a prerequisite for spokes. Second, the long history and stability of the hubs is also increasing the reputation of the partnering spokes. Thus, except for the accessing of technology, spokes seem to be guided by very similar benefits.

Considering the analysis of the three management mechanisms, also no clear support could be found for the propositions. Here, one group feels that standardization is, albeit important, also a danger to their business model. The other group sees standardization in a more positive light. Also, some of the spokes see monitoring the hub as key necessity for a successful relationship, while others do not feel this way. Some of the spokes believe that personal relationships are the optimal management mechanism, others disagree. Interestingly, these distinctions on all aspects run constantly between two neatly separable groups of spokes.

Analyzing the underlying reasons for this dissent between the two groups, the importance of the business functionality that is included in a spoke's solution has been determined as playing a key role. The two groups differ largely between whether the spokes are supplying largely solutions for technical integration or whether they are supplying solutions which include much business knowledge. For the first group, accessing technology is considered as being of prime importance. However, at the same time the enhancements of standardized interfaces are threatening their solution, as the technical integration that they so far provided might be included in the new standard. Interestingly, these spokes are also those that are not primarily interested in monitoring the hubs. A possible argument for why this is the case has been found in the fact that the stability in their context is much higher than for the other group. Finally, personal relationships are considered a good enough management mechanism in this context, as the increased stability in their environment is more predictable than in the context of the other group. This renders the subjectivities in personal relationships less grave.

However, when considering the entire picture of an inter-organizationally structured IS development industry, a more sophisticated picture emerges. The first group is indeed considered to be less important by the hubs, and thus also has to live with less dedicated support. However, at the same time, the solutions developed by this group are also not in the focus of the hub organization. Thus, they are assumed to indeed enjoy a longer lasting relationship. In contrast, the partners that supply domain knowledge are also those that might be acquired by the hub - at least the successful ones. This is indeed a tightrope walk that can be considered very specific to the IS industry. Those partners that provide important domain knowledge are those that are best supported by the

hub. However, if they become too successful, they are also those that are acquired first. This is indeed a cycle that is even today making the realization of an industrialized IS development approach difficult. This industrialization can only be realized through foresighted management of fruitful partner relations by both hubs and spokes.

5.3 Contribution to Theory Development

The present study has yielded significant insights not only into why currently the structure of the IS development industry is changing, but also into how the newly emerging structure should be managed. However, from a scientific viewpoint it also contributed to the development of the applied theories and concepts. In order to obtain these insight, various theories have been applied to the context of IS development. Indeed, such an application of theories to various specific contexts is the only possible path towards a better understanding of the underlying theories themselves. This in turn allows for the identification of possible shortcomings within the theoretical frameworks and through this, the progress of a scientific field (Kuhn, 1970). Thus, the following discussion focuses on the contributions to this type of theory development of the present study.

The first research objective, why organizations developing enterprise IS are adopting a cooperative, networked growth strategy, has been motivated through the resource-based view and its derived theories. Indeed, as it has been discussed, today this scientific school is playing an important role not only in IS research, but further in the field of organizational science, which was used as a reference discipline (Keen, 1980). Especially in the context of exploratory studies, this concept has proven to be sufficiently narrow to allow for the explanation of strategic decisions based on a well structured taxonomy of resources that an organization possesses. At the same time the concept is sufficiently broad to allow for the inclusion of a vast range of these resources. This study has also clearly benefited from this flexibility of the concept.

Besides the *pure* resource-based view as underlying theory, other derived concepts have also been supplied in the context of the present study. First, the idea of dynamic capabilities has been used. This concept has been criticized for being a endlessly recursive, multi-order concept (Collis, 1994). That is, one can always find a capability that alters other capabilities. It has been argued in the context of this study that, as the ability to develop complex IS has to be considered a dynamic capability in itself, the ability to manage such a IS development network should be, if the critics are right, such a second order capability. However, as the present study has clearly indicated, the capability to manage such a network are not too different from the management of other complex, boundary-spanning arrangements. Thus, the finding of this study support Eisenhardt and Martin (2000, p. 1116) in their perception that "dynamic capabilities are not tautological, vague, and endlessly recursive (...). Rather, they consist of many well-known processes such as alliancing, product development, and strategic decision

making that have been studied extensively in their own right, apart from RBV. Their value of competitive advantage lies in their ability to alter the resource base: create, integrate, recombine, and release resources."

Furthermore, the concept of intra-organizational resources of capabilities has be extended to the inter-organizational context. Here, especially the idea of supplementary and complementary resources and capabilities as it has been raised by Das and Teng (2000) has played an important role. Indeed, very good support has been found for the distinction between these two different types of resource alignments. However, also a temporal notion has been added to the concept. The hub companies were found to also partner with those small companies that were offering functionalities that the case companies considered to be within the scope of their systems. However, this only for functionalities for which no actual solution of the large companies existed. This situation could be termed as *latent* supplementarity or *temporary* complementarity. In such a situation, the partner is providing a solution that the hub case companies would actually like to provide themselves. However, they have so far been unable to do so - for whatever reasons. Those partners had similarly fruitful relationships with the case company as those that provided infinitely complementary functionalities. The situation was found to be entirely different if the small spoke partners provided supplementary functionalities. These were indeed allowed to partner if customers actually demanded their specific niche functionalities. However, these relationships were not found to be very stable ones. Indeed, the case company actively attempted to integrate these functionalities into its own system.

Approaching the second research objective, how organizations manage the relationships to other network participants, has been conducted form two distinct starting points. First, three theories of the firm have been used to explain how behavioral issues can be countered in such a setting. These have been transaction cost theory, principal agent theory, and the theory of incomplete contracts. The first has been widely used in the IS community. Here, especially one point emerged. Commonly, in IS transaction costs are reduced to those emerging from human assets specificity. In this study, no support has been found for this limitation. Indeed, large IS vendors explicitly partner with smaller organization in order to gain access to their *closeness* to potential customers. The principal agent theory has also been widely used in IS research. In this context one prominent aspect emerged throughout the present study. Namely, that the conjoint development of complex enterprise IS cannot be considered a typical principal agent relationship, in which one party (the principal) delegates work to another party (the agent). Rather, both parties are dependent upon each other, the hub requires the spokes for complementing its solutions portfolio and the spokes require the hub for providing essential basic functionalities within the platform[1]. Finally, in IS research, the theory of incomplete

[1] This is more a situation of mutual dependence as it has been described in the excursus on the resource dependency theory.

contracts has so far been applied largely to outsourcing or offshoring arrangements. The present study has yielded interesting insights on the basis of this theory, which gives good support for further pushing this somewhat neglected theory.

Parallel to the application of these theories of the firm, also the concept of interdependencies and their coordination has been used in this study. A first remark to these two broad concepts used to approach the second research objective is the fact that they yielded similar hypotheses. This integration of these two different bodies of literature has, to the best knowledge of the author, not been conducted before. It can be considered a valuable contribution to the better understanding of complex interactions specifically within the IS development industry, but also in other inter-organizational settings in general. Thus, the perception of Gulati and Singh (1998) that, in these inter-organizational networks, two distinct types of issues emerge from behavioral and complexity reasons could not be clearly supported. Besides that, the classification of interdependencies of Thompson (1967) has proven to be a valuable instrument for the studying of IS development. Especially the perception that these classes of interdependencies build upon each other has been well supported by the studying of IS development networks. Also the therefrom resulting coexistence of multiple coordination mechanisms has been found in the present study.

Besides these main theories, various others have been highlighted during several deliberately positioned digressions throughout the text. These have not been further followed, thus no clear deductions could be made on their appropriateness. However, the reader of this study is advised to pick up these ideas and follow them as deemed fruitful. Some possible new directions of future studies are subsequently introduced in more detail.

5.4 Delimitations of this Work and Implications for Further Studies

The above conducted brief summary of this work, its findings and theoretical contributions, has already shown that the approach has yielded significant results. However, before considering the implications of these findings, first its delimitations should be discussed. The goal of this discussion of the delimitation of this work is not a general criticism of either the applied theories or the applied methodology. These have already been discussed throughout the theoretical part of this study (e.g. Chapters 2 and 3). Rather it is the goal of this discussion to point out issues that had a very fundamental influence on the entire research effort. As main aspect here again the four already discussed *motors* for change come into play (Van de Ven and Poole, 1995). As it has been argued in Section 2.1.3, also the two motors that have not been discussed in more detail could have been fruitfully applied in this context. Discussing them first of all makes the delimitations of this work even clearer. And, as addressing these delimitations can be considered the consequential step in the research process, it also translated into directives for future work.

The first change motor that could be successfully applied would be the *life cycle* one. Considering such an entire life cycle of a partner, it becomes obvious that inherent dynamic could be addressed much better through a process perspective than through the here selected variance theoretical approach. This has been one of the key delimitating aspects of this study. As it has become obvious, the partnering between different companies in the IS development industry ideally should not be seen through this lens. Indeed, both the benefit categories and the management mechanisms that have been considered as core to this work have yielded process views on the discussed issues. Thus, it would be beneficial to actually consider the process of a partnership development as a unit of analysis of future work. This would require a future researcher to conduct a well founded selection of partners and to follow these partners over time (Van de Ven, 1992). The current study has been able to distill this process view from the snapshot interviews that have been conducted. While this *extrapolation* of a process from a single point in time can be done in research, it is less than ideal (Zaheer et al., 1999). Thus, its explanatory power is limited as "process theorization needs to go beyond surface description to penetrate the logic behind observed temporal progressions - whether simple or complex." (Langley, 1999, p. 694).

In this context, it has to be stated that such a process theory development poses considerable more obstacles than a variance theoretical approach (Mohr, 1982), and thus also requires substantially different methods (Langley, 1999). In this context, Van de Ven (1992, p. 181) argue convincingly that, "if the purpose of a study is to understand how to manage the formulation or implementation of an organizational strategy, it will be necessary for researchers to place themselves into the manager's temporal and contextual frames of reference". This is also in line with *direct research*, as it has been proposed by Mintzberg (1979a, p. 586): "Measuring in real organizational terms means first of all getting out into the field, into real organizations. Questionnaires often won't do. Nor will laboratory simulations, at least not in policy research." As the present study has laid the foundational groundwork for such a future approach, the amount of collected data promises to be manageable in this context. This especially as it might now be possible to carefully focus on the simplest form of an organizational network, "the *pairwise relationship* between two organizations" (Van de Ven et al., 1979, p. 20, emphasis theirs). Through this, it would also be possible to limit the research with regard to the number of involved individuals. In the present study, individuals responsible for the entire partnership program for each case company have been interviewed. In contrast to this approach, a narrower focus might reduce the number of individuals that could be interviewed or otherwise consulted. This would also reduce the vast amount of data that is given, a common problem in such research (Mintzberg, 1979a).

Obviously, this is only one potential direction in which this research could be further developed. Indeed, while this direction is including a *reduction* in the number of studied organizations, there is also the option to *increase* that number. At some instance it has already been mentioned that the networked IS development industry has been described as an *ecosystem*. Thus, using the *evolutionary* change motor, the findings of this study

could be further validated in, for example, a more comprehensive survey. Obviously, this would include the digging into more details of each single aspect of the broad umbrella that has been spanned in this study. An operationalisation of the different aspects of the proposed model, and the testing of the here preliminarily unfolded coherences might yield interesting results[2]. Relating a somehow measured innovativeness, e.g. through the number of patents pending, the R&D budget, or other things, to successful partnering with hub companies might yield whether indeed more innovative companies are more successful. Similar approaches might be taken in the field of managing the network. One could for example measure whether indeed those partners that are bringing the most revenues are also those that are enjoying the closes dedicated support. As the emphasis on the exploratory nature of this study has suggested, there are a multitude of open opportunities in this area. Every single research effort in this context contributes to a better understanding of the complex interactions in the inter-organizational IS development network.

These ideas are all rooted in the broad paradigms of organizational research. However, there are also other lessons that can be learned from this research effort. These lessons are mainly of relevance for practitioners that have to manage the network relationships of their organizations. However, these ideas might also be of value for researchers in neighboring disciplines of IS research.

5.5 Implications for Practice

Besides opening the door for new scientific endeavors in the field of organizational research, such as those sketched above, this study has also several implications for practitioners, both from hub and spoke organizations. Foremost, the newly evolving industry structures have to be actively considered for strategic decisions of managers in both hub and spoke companies. Whenever determining the direction in which a company is supposed to evolve, partners have to be considered. This has been aptly summarized by Lorenzoni and Baden-Fuller (1995, both p. 157) under the heading of *Simultaneous Structuring and Strategizing*: "Strategy conception and implementation of ideas is shared between central firms and their webs of partners." In this context, especially the "structuring of the relationship between the partners goes hand in hand and is seen as key part of the strategy." Two aspects have to be emphasized in this context.

First, partner structures have to be considered simultaneously as open networks and tight binding to the hub. Simply because breakthrough developments of small, innovative partners can be definition not be foreseen by large hub organizations, a multitude of these partners has to be integrated into the hubs' partner networks in order to ensure

[2] This approach would follow the typical sequence of exploratory, such as this one, and confirmatory studies, as it has for example been put forth by Kerlinger and Lee (2000, p. 586): "Exploratory studies have three purposes: to discover significant variables (...), to discover relations among variables, and to lay the groundwork for later, more systematic and rigorous testing of hypotheses."

that the few critical partners are among them. This viewpoint is also emphasized by the perception of Dyer and Singh (1998) that *partner scarcity* is a key to sustaining competitive advantages that originate in network relationships. These critical partners have to be bound to the network early on in order to tap into their potential. In order to achieve this goal, network structures have to be easily accessible for even the smallest and presumably most unimportant partner. This is the openness aspect of the network relationships. At the same time, these partners have to be tightly bound to the hub on a long-term basis. If small partners are alternating their loyalty on a regular basis, they are of no substantial value for the network. Only if the spokes consider themselves an integral part of the hubs' partner networks, their binding to this network will be of substantial durability, and thus of mutual benefit. This fact leads over to the second, probably more concrete lesson learned from this work.

Active partner management is mandatory in this context. As it has become clear through the discussions on the spoke partners in this work, the dominating management mechanism clearly are close personal ties between involved individuals. As it has also been discussed, this is at the same time the most expensive one of the discussed mechanisms. Two possible consequences can be derived from this fact. Either, it can be attempted to reduce these personal interactions in the relationships. All participants in the IS development network are well advised to enforce the use of standardized technologies, but also standardized communication channels and the like. They are also well advised to enforce transparency in the network through better monitoring their partners, but also through allowing their partners to better monitor themselves. However, at the same time it can be expected that this will not be enough. So, the second advice is to better structure the necessary personal relationships. In the context of software development this structuring of individual cooperation has recently been addressed as part of the reliance on collaborative software development platforms. These platforms have emerged from the open source community, in which specialist software engineers cooperate in a highly distributed fashion across geographical and organizational boundaries (Robbins, 2005). Further developing these platforms would first enable the involved individuals as well as their organizations to smoothly coordinate their cooperations. From a scientific perspective these platforms also promise to be an interesting study object. First, their enhancements themselves can and should be considered as scientific work in the sense of *design science* as it has been proposed for example by Hevner et al. (2004). Also, building on the recent analysis of these platforms with special regard to the social networks that form around them promises to improve the understanding of their dynamics (Lopez-Fernandez et al., 2006), and thus also to contribute to the here described goal of smoother functioning network relationships.

Besides these implications for hub organizations, there are obviously also those for spokes. They are less involved in the management of the entire network and focus more on the single relationship. Thus, the advice given to them is also addressing these concrete relationships. The most important aspect of this is the overlap of the spokes' solution with those of the hub. Small partners are well advised to focus on those tasks in

the network that they are better able to address then their large partner. This is mostly the development of innovative solutions. Small partners are well advised not to rest once they have achieved a seemingly comfortable situation in the network - the hub is not going to do so either. Rather, the small partners should strive for continuously cooperating with their customers to enhance their solution. These enhancements should not be limited by past developments, also not foreseeable directions should be considered. This agility, flexibility and closeness to customers is what distinguishes them from the large hubs, and what can consequently be successfully deployed in the inter-organizational IS development industry.

This involvement of various parties in such a networked industry is thus key to its success. However, these different parties are all playing different in this structure. This is the key idea in the context of an IS development *ecosystem* (Messerschmitt and Szyperski, 2003). In order to ensure that this ecosystem is also a *robust* one, all involved organizations and individuals have to be aware of these characteristics and also to manage their relationships according to their role (Iansiti and Levien, 2004).

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