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# Co-opetition in next-generation access provisioning – An analysis of the German broadband market

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**Abstract:** The growing customer demand for next-generation access networks requires large investments into novel broadband infrastructures. Politicians, scientists and practitioners have been discussing the question if cooperation between today's broadband carriers can contribute to a cooperative setup of next-generation access networks. In order to advance this discussion we assess horizontal, vertical and diagonal cooperation between today's carriers based on a grounded theory approach. We base our findings on more than twenty-five expert interviews in eleven telecommunication companies of the German broadband market. Our results indicate that cooperation is currently primarily evolving at vertical and diagonal cooperation interfaces. Moreover, the German broadband provisioning market is heading towards a continuously deconstructed telecommunication value chain and standardized wholesale products which are primarily offered at vertical and diagonal cooperation interfaces.

## **1. Introduction**

As broadband usage continues to grow, large investments in new infrastructures and technologies are necessary in order to satisfy the future broadband demand of end customers. In many cases this implies the replacement of legacy copper networks which have been rolled out by public telephone companies. After a series of deregulation activities in the telecommunication sector of most countries these networks can now be renewed by numerous market players with different sets of resources. Due to the large extend of necessary infrastructure investments some experts identify cooperation as the only feasible way for a market-driven establishment of Next-Generation Access (NGA) networks (Gerpott 2010). In many cases this implies that competitors need to establish cooperative relationships. Nalebuff and Brandenburger (1996) have denoted this ambivalent relationship between companies as co-opetition. As pointed out by (Ragoobar, Whalley and Harle 2010) NGA deployment can be largely influenced by country specific preconditions. In the course of our analysis we will therefore focus on assessing NGA deployment cooperation in the German broadband market. In a first step we will introduce theoretic foundations of cooperation in the telecommunication sector. In the subsequent sections we will elaborate our research questions and our research methodology. Thereafter, we explain how carrier types differ with respect to their cooperation strategies. Finally, we interpret our findings in section 5.2 and derive implications in section 6.

## **2. Theoretic foundations**

Due to the liberalization of monopoly incumbent infrastructures of many countries around the world, competitive market dynamics have become common at the Service layer of broadband markets. In fostering these market dynamics many regulators were turning towards the so-called ladder of investment. This concept aims at decreasing entry barriers for new market entrants in order to eventually foster competition between fully integrated telecommunication companies (Cave 2006, Herrera-González 2011). In its original specification the ladder of investments requires the regulator to increase access prices once the new market entrants start to generate revenues. This step is supposed to foster investments at downstream value-added steps of the telecommunication value chain so that the new market entrants can eventually offer more differentiated products (Picot and Wernick 2007). However, as of today most European regulators have not increased access prices but access prices have been falling (Picot and Wernick 2007, EU-Commission, 2006). Nevertheless, several fully integrated telecommunication carriers have evolved in European countries like for example Germany. Moreover, several specialized companies compete and cooperate at single value-added steps of the value chain. This development aligns with the findings of Li and Whalley (2002) who identified a trend towards a deconstruction of the telecommunication value chain. IP-based infrastructures and a commoditization of the telecommunication infrastructure contribute to this disintegration (Mölleryd, 2011).

This ongoing deconstruction contributes to the development of several potential cooperation interfaces at different value-added steps of the telecommunication value chain. Following

(Fransman 2002), the value chain of the telecommunication industry can be subdivided into three functional layers: Service, Network and Asset. The Service layer ensures access to end customers. At this layer marketing and product development are the primary value-added activities in the value chain. At the Network layer companies provide broadband access by enabling data transport to backbone networks. At the Asset layer companies provide and maintain the physical infrastructure that is required for offering services at the network and the Service layer.

As proposed in (Limbach et al. 2011) the three layers of the telecommunication value chain imply five cooperation interfaces.

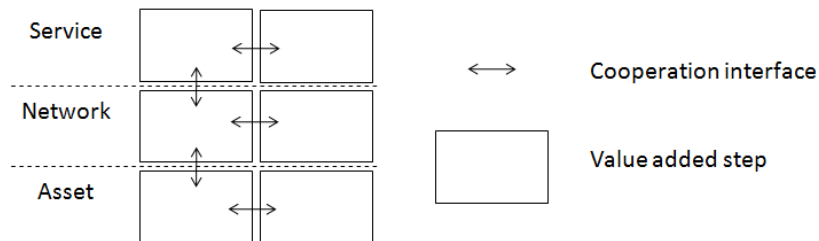


Figure 1: Cooperation topology for the telecommunication industry (Limbach et al. 2011)

As depicted in Figure 1. cooperation interfaces between companies can be horizontal or vertical in nature. Moreover, we will access diagonal cooperation between telecommunication and companies which originally do not provide telecommunication services.

### *Horizontal cooperation*

Horizontal cooperation is characterized by the coordination of activities which are associated with the same value-added step of the supply chain (Gerpott 2005). Accordingly activities of horizontal cooperation result in similar market goals, products and services. Moreover, horizontal interfaces show overlapping core competencies between partners more often than vertical interfaces. Also common goals of cooperation partners can be observed more often than in other types of cooperation (Limbach et al. 2011).

Transient horizontal strategic alliances which increased bargaining power and reduced operation costs could in many cases be observed when a national telecommunication market was opened for competition (Troulos et al. 2010). Moreover, horizontal cooperation is common in transnational cooperation agreements (Gerpott 2005).

Due to products and services which are similar to competitor's products horizontal cooperation is potentially more harmful on competition than vertical agreements (Mölleryd 2011). Horizontal cooperation in the telecommunication industry is characterized by the fact that cooperation partners are cutting competitive activities in the field of their cooperation while they continue to compete in other business fields (Gerpott 2005).

### *Vertical cooperation:*

Vertical cooperation refers to business relationships at different value-added steps of the telecommunication value chain. That is, services or products of cooperation partners are complementary to each other and are said to enhance economic efficiency (Mölleryd 2011). Vertical cooperation can decrease the costs of coordination between firms and is closely related to considerations of transaction cost theory (Mölleryd 2011, Williamson 1975).

According to the organizational failure framework which was proposed by Williamson (1975), transactions differ with respect to uncertainty, asset specificity, ease of measurement and frequency. Based on the proposed framework it can be argued that a vertical integration is advised if asset specificity of a transaction is high. That is, if jointly used resources can hardly be redeployed for production of a different purpose. Moreover, the framework suggests that a high number of transactions or high uncertainty should result in vertical cooperation as a hierarchical organization offers mutable mechanisms which prevent opportunistic behavior (Picot 2003). According to Mölleryd (2011) it is also more likely that investments can be returned if a company controls that entire value chain.

### *Diagonal cooperation:*

In addition to horizontal and vertical cooperation we will assess diagonal cooperation. Following Gerpott (2005) we refer to cooperation as being diagonal if cooperation partners belong to different industries. That is, cooperation between a telecommunication company and a utility company would be denoted as vertical cooperation. In general diagonal cooperation can be subdivided into input oriented and output oriented cooperation. Whereas input oriented cooperation focuses on the joined utilization of complementary resources, output oriented cooperation aims at the creation of novel services or products (Gerpott 2005).

## **3. Research question**

In this paper we aim to assess how vertical, horizontal and diagonal cooperation will influence NGA provisioning in Germany during the next years. Moreover, we aim to understand the drivers of cooperation in the complex value network between partially disintegrated telecommunication operators. This superior research question can be subdivided in the following sub questions:

1. At which potential cooperation interfaces does cooperation evolve in the German broadband market?
2. At which interfaces do companies avoid cooperation in favor of standardized wholesale products? What is the preferred institutional arrangement for an interface?

### 3. Do carrier types differ with respect to their cooperation motivation?

We will address these questions with a bottom-up research approach that is based on the conduction of expert interviews. The research methodology and data will be introduced in the subsequent section.

## 4. Research methodology and data

### 4.1 Methodology

The previously defined research question will primarily be addressed based on the assessment of semi-structured expert interviews with decision makers from most major companies which offer broadband infrastructures and services in Germany. The majority of our interview partners is either directly accountable for setting up cooperation with other telecommunication providers or contribute important analyses during the setup process of cooperation.

We assess co-opetition in the broadband provisioning process with a Glaserian grounded theory approach (Glaser 1992). Thus, we chose a research approach that requires the researcher to be passive when conducting the interviews. By choosing this approach we refrained from directly asking interviewees about horizontal, vertical and diagonal cooperation. Instead we implemented our questions about cooperation interfaces in a broad spectrum of questions correlated with seven general categories including *telecommunication value chain*, *cooperation initiation*, *cooperation design* and *success factors of the broadband provisioning*. These categories served as a basis for exploring the research field of co-opetition in next-generation access provisioning. However, due to the semi-structured nature of our interview setup, we conducted additional questions based on the interviewee's responses. Even though we generally followed a Glaserian grounded theory approach we also partially implemented a Straussian grounded theory approach (Halaweh et al. 2008). That is, within our general categories we also asked for questions which are related to transaction cost theory, vertical (des)integration, advantages of a fully integrated broadband provider. Even though these questions were related to well-known theoretic concepts, we designed the questions in such a generic manner that interviewees could refer to different concepts other than the once listed above.

### 4.2 Data

The interview partners were identified in a three step process. In a first step we contacted the participants of the work group Interoperability at the NGA-Forum which was setup by the German regulation authority in order to foster cooperative broadband deployment projects in Germany. In a second step we asked the participants to establish further contacts to decision makers within their company. Finally, we asked the experts to establish contacts to existing cooperation partners in other telecommunication companies within Germany. Using this procedure we are able to conduct interviews with more than twenty-five experts in eleven companies. Each expert interview had a length of either sixty or ninety minutes. In order to

ensure the robustness of our results we follow the procedures suggested by Yin (2003). That is, we triangulate the interview results of experts which work within the same company. Moreover, we asked to experts to provide additional documents which have been used during the setup process of cooperation. Furthermore, we conducted interviews at several companies within one operator category. Finally, we utilize existing literature such as press releases in order to interpret our findings.

## **5. Carrier comparison and interpretation**

### **5.1 Comparison**

We conducted our interviews with four different types of carriers and the management of a cable operator. In this section we will briefly describe the operator characteristics and explain their company's motivation for engaging in horizontal, vertical and diagonal cooperation. The results of our analysis are consolidated in Table 1.

In our analysis we conducted a variety of national carriers including the national German incumbent. The non-incumbent national carriers are either a subsidiary of an incumbent from another European country, have started out as a national local carrier or only operate at the Service layer of the value chain.

Most interviewees from national carriers stated that horizontal cooperation might be a feasible way to deploy broadband networks. However, large vertically integrated operators make clear that make-or-buy decisions will always be conducted before cooperation is considered. This is due to the fact that horizontal cooperation between national carriers is subject to regulatory rules and shared investments in many cases also imply shared profits. As of today, little horizontal cooperation could be observed between national carriers. Vertical collaboration can be observed more often. Especially standardized Bitstream-Access (BSA) products which are provided at the Service layer are requested by most national carriers. The BSA product is associated with view initiation and controlling costs. According to the conducted interview vertical cooperation is the preferred cooperation form. This is due to the fact that tangible resources and intangible skills are usually complementary, whereas competition dynamics between cooperation partners are remote. Furthermore, some national carriers clearly stated that they do not follow the ladder of investment concept with respect to NGA broadband provisioning.

City carriers evolved in many German cities after the liberalization of the German telecommunication market. Following a strong consolidation in the city carrier market few city carriers remained. According to our interviewees these carriers are perceived to be very successful in providing broadband infrastructure their home market. The assessed city carriers are fully integrated. According to our interviewees city carriers are interested in horizontal cooperation at the Service layer. That is, city carriers would like to sell white label broadband services to their customers which as of today are proprietary products of national carriers. Our interviewees also indicated that city carriers are willing to provide BSA products to other carriers in the market. Generally city carriers are very open to diagonal cooperation with utility companies especially if they have already acquired the necessary knowledge which is specific to broadband deployment.

B2B carriers which were assessed in our interviews are specialized in providing business services as well as national and international aggregated infrastructures to their customers. Accordingly network operation is an important part of their business activities. Moreover, the assessed B2B carriers provide wholesale services to national carriers. Our interviewees indicated that in special cases horizontal cooperation can be required by a service customer if two or more business carriers own complementary resources which are required for providing the service desired by the customer. This is due to the fact that mutual buying of these resources would increase the price for the final service provided to the customer. According to our interviewees B2B carriers perceive themselves as platform operators between the Asset and the Service layer of the telecommunication value chain. It was stated that B2B carriers exhibit a competitive advantage as opposed to fully integrated carriers because a specialized network operator has no incentive to discriminate services at higher value chain layers. Thus, vertical cooperation can be observed at all Network layers. B2B carriers clearly stated that they are very interested in cooperation with utility companies. This is particularly true if future commercial areas are provided with broadband infrastructures.

Municipal carriers are characterized by strong local ties in rural areas. These carriers primarily evolved in areas where the traditional incumbent infrastructure provided lower broadband speeds than in other areas of the country. Generally public funding is an important part of the broadband deployment business cases. Our interviewees indicated that in addition to the acquisition of public funds municipal carrier are interested in horizontal cooperation with city and national carriers. This is particularly true for cooperation at the Asset and the Network layer. Moreover, municipal carriers depend on the acquisition of wholesale products from national or city carriers in order to extend broadband offerings and utilize economies of scale in marketing. Usually shared investments with local utility companies are an integral part of a broadband deployment business case. Moreover, those contracts are usually characterized by contract durations of up to twenty years.

As of today German cable operators are hardly subject to regulatory measures. Thus, most of the German cable operator market is subdivided among three major market participants. Whereas traditionally cable operators only distributed telecommunication signals, today usually triple- and quadruple-play services are offered to the customers. Accordingly the German broadband market is currently subject to infrastructure competition between cable operators and telecommunication companies. This results in a situation where cable operators hardly compete or cooperate at the Asset layer. At the vertical cooperation interfaces interviewees from one cable company stated that they are generally open minded with respect to providing fiber-optic network wholesale products to telecommunication companies. At higher value chain layers technical difficulties currently prevent cable operators from providing wholesale products to telecommunication companies. However, cable operators also distribute service offerings of competing cable operators if this is generally desired by the customer and if a proprietary cable operator infrastructure does not exist. Like telecommunication companies cable companies rent fiber-optic network capacities from local utility companies. Furthermore, cable companies partially bridge gaps within the networks of utility companies in order to pursuit systematic role out plans.



Table 1: Endogen determinants of broadband provisioning in Germany

	Horizontal	Vertical	Diagonal
National	(A-A) Infrastructure co-investments have been explored within small pilot projects but are generally difficult due to regulatory preconditions	(S-N) Request for BSA from national network operation aggregator or local carriers with high market share (S-N) Ladder of investment concept is not pursued by all service providers	(N-A) New mobile infrastructures can be setup by utility companies and mobile operators without intersection of core competencies (N-A) National carrier aim to operate infrastructures of utility companies
City	(S-S) In some cases city carriers are interested in selling white label services which are currently proprietary services of national carriers	(S-N) BSA wholesale products for national carriers are either planned or already available	(N-A) Carriers are open to cooperation with utility companies since the required knowledge has been acquired
B2B	(N-N/A-A) Joint product offers with reduced costs for customer (Mutual wholesale would have increased the price)	(S-N) Service provider aim at the establishment of standardized interconnections	(N-A) A pure network operation activity offering signals little risk of opportunistic behavior for utility companies
Municipal	(A-A/N-N) Cooperation with larger strategic partners is desired but fails due to a lack of municipal resources	(S-N) Wholesale offerings form incumbent are required in order to expand reach	(N-A) Infrastructure investments of utility companies are an integral part of municipal carrier's business case
Cable	(A-A) Due to regulatory preconditions cable operators hardly compete at the infrastructure layer	(N-A) Some cable operators generally consider wholesale of fiber-optic network capacities to telco carriers (S-N) In general some cable operators are willing to provide wholesale products to telco carriers. (S-N) Some cable operators distribute service offerings of competing cable operators	(N-A) Cable operator buy fiber-optic capacities from utility companies (A-A) In few cases cable operators close provisioning gaps of local utility companies

## 5.2 Interpretation

In Table 1 we provide an inside-out assessment of the German broadband provisioning market. That is, we assess the endogen determinants of broadband provisioning in Germany. The results show that we were able to assess horizontal, vertical and diagonal cooperation between four carrier types and a cable operator. In general horizontal cooperation can be observed less often than vertical or diagonal cooperation. Horizontal cooperation is in many cases either inhibited by regulatory preconditions, competitive dynamics or a lack of bargaining assets. Thus, cooperation potential of critical-mass alliances is currently not being leveraged in the German broadband market.

Vertical cooperation can be observed or is emerging at cooperation interfaces of many carrier types. Among carriers of the German broadband market vertical cooperation can primarily be observed between the Service and the Network layer. At this cooperation interface the German market is headed for standardized BSA products which are offered to competing carriers. All interviewed carriers have indicated that BSA products can be beneficial for business flexibility. However, in some cases technical difficulties must be overcome before a truly standardized BSA can be offered to the market. Asset-Network cooperation can hardly be observed in the German broadband market. Most interviewees indicated that such cooperation would usually result in an intersection of core competencies. Moreover, it would result in increased cooperation complexity and is not required if BSA products are working properly.

Diagonal cooperation with utility companies is very common for City, B2B and Municipal carriers and can also be observed with other carrier types. Interviewees indicated that complementarity of resources and longer amortization times in utility company business cases contribute to the popularity of this type of cooperation. Generally carriers prefer the rental of passive infrastructure over joint investments. Moreover, carriers prefer long contract durations of up to twenty years over shorter contract durations.

To summarize, cooperation between German broadband carriers can primarily be observed at vertical and diagonal cooperation interfaces. Horizontal cooperation can only be observed in few cases. Thus, our results did not provide evidence that the current types of broadband cooperation are reducing competitive dynamics. Moreover, carriers prefer market arrangements over joint investments in active and passive infrastructure. Following transaction cost theory these findings can be explained with a reduction of transaction uncertainty.

## 6. Conclusion

In this paper we assessed horizontal, vertical and diagonal cooperation in the German broadband market based on a three-layer cooperation topology framework for the telecommunication value chain. Following a grounded theory approach we conducted

interviews with four carrier types and one cable operator in order to identify the endogenous determinants of broadband cooperation.

Our results indicated that the German broadband market is fostering broadband deployment with standardized wholesale products at vertical and diagonal cooperation interfaces. Moreover, our results did not provide evidence that horizontal cooperation will reduce competitive dynamics. In general we find that cooperative broadband provisioning primarily aims at reducing uncertainty. Finally, we find that horizontal cooperation only evolves if both cooperation partners can provide complementary assets.

In this paper we focused on the assessment of the German broadband provisioning market. Caution is advised in generalizing the results of our analysis for other countries as national broadband provisioning processes can differ largely due to country specific preconditions (cf. Ragoobar, Whalley and Harle 2010).

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