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On co-opetition between mobile network operators: Why and how competitors cooperate

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On Co-opetition between Mobile Network Operators - Why and How Competitors cooperate

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Abstract

This paper address issues about cooperation among and competition between mobile network operators. The starting point is to examine why and how operators share infrastructure for mobile communication services, so called network sharing. The paper analyzes drivers, benefits and obstacles of network cooperation. We also analyze how roles and responsibilities are distributed for the network related functions while concurrently operators compete for customers and have separate functionality for service provisioning, marketing, customer relation management, charging and billing.

Next, we analyze how network sharing as such and strategies for network sharing have changed in Sweden from the year 2000 when the 3G licenses were awarded and up to the year 2010. Moreover, network sharing in Sweden is compared with India where the market situation is different, as the number of operators is four times more and the cooperation is organized in another way, with separate tower companies, which provides base stations sites where operators are tenants. Finally, we compare the network sharing cases with how mobile operators organize cooperation for mobile payments services.

From our empirical data we can identify four different types of co-opetition among mobile operators.

1. *A co-operative spirit* with focus on working practices and/or principles that will facilitate the common use of resources or solutions. 2. *Infrastructure cooperation through a third party*, e.g. a tower company or a SMS aggregator with the main objective to reduce costs or to provide a common solution. The operators have agreements with a third party but not with each other. 3. *Infrastructure cooperation through a joint venture* that is responsible for network deployment and operation. The driver is to achieve cost-savings. The operators have their own service provisioning, billing, customer relations management and compete for end-users. 4. *Service and infrastructure cooperation through a joint venture* that is fully responsible for providing the end-user service, in our case mobile payments. The main driver is to offer a payment solution common for all operators in order to complement or compete with solutions provided by banks or payment service providers.

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INTRODUCTION

This paper addresses the issue on why and how mobile network operators (MNOs) cooperate with their competitors. Traditionally telecom operators, especially the former state-owned monopolies, have had a lot of different resources and competencies in-house and offered services using a vertically integrated value chain. In the 1980's, TeliaSonera, had: R&D (both internally and the development company Ellemtel co-owned with Ericsson), network deployment including civil works and development and manufacturing of switches and handsets.

Today, the situation is very different for the mobile operators. Activities like tele-marketing, helpdesk, and billing are outsourced, characterized by a cooperation in a traditional buyer-seller context. Another trend involving close cooperation between mobile operators and network manufacturers is outsourcing of operation and maintenance of the networks. Managed services are a growing part of the business and revenues of companies like Ericsson and Nokia-Siemens Networks. The network management services are in many cases, emerging markets, combined with the deployment of network equipment and network roll-out. This results in close cooperation between providers of the managed services and the mobile operators. All the mentioned types of cooperation are done in a buyer – seller setting.

However, with the introduction of third generation (3G) mobile networks after the year 2000 a new type of cooperation emerged, the sharing of networks between competitors. In Sweden, a close cooperation between mobile operators was established using joint ventures for the network planning, deployment and operation of mobile networks. Two network sharing companies have existed for 10 years. When fourth generation (4G) was announced the business landscape changed. One of the sharing partners in one of the joint ventures decided to build its own network. The result was that a new joint venture was formed, while the two existing joint ventures continued its business.

Hence, the Swedish network sharing companies are interesting to investigate in order to examine “why and how” the cooperation between competitors is established. By using this as a starting point we will also make a comparative analysis in three different domains. In the *time domain* we will analyze how network sharing strategies have changed in Sweden during the years 2000 and 2010. Next, we compare network sharing in Sweden and India, as these countries have a totally different *market structure* and level of development for mobile services. Finally, we compare network sharing with another *application area*, mobile payments, where mobile network operators in Sweden currently are very active and exploring new forms of cooperation with each other.

The overall purpose with the paper is to identify and describe different patterns of co-opetition used by mobile network operators. The research questions are:

1. What drivers and obstacles for cooperation can be identified?
2. How is the cooperation organized?
3. What are the consequences of the cooperation?
4. What role does joint ventures play in relation with the mobile operators?

Concerning network sharing we deal with intra-industry cooperation between competing companies. When it comes to mobile payment services the intra-industry cooperation (between operators) is established in order to compete with another industry, financial institutions like banks, credit card companies and other payment services providers.

RELATED WORK

SHARED NETWORKS

Descriptions of options for *sharing of technical resources* among cooperating operators were common during the years after 2000. Different strategies for sharing of base station sites, antennas, radio equipment have been presented by some researchers (Village et al, 2002), (Beckman and Smith, 2005).

Business opportunities and potential cost savings was described in a number of white papers from the telecom vendors that started to appear after year 2000. Ericsson presented an updated version in 2010. . The benefits and barriers of network sharing are discussed in (Tankard, 2010). In (Frisano et al, 2008) a business analysis is presented using a business model classification and analysis approach proposed in (Wymann, 2007).

Regulatory aspects of network sharing are discussed in (Hasbani et al, 2007) and (Lefevre, 2008). In many cases analysis reports are prepared on behalf of a national regulator, one example from Sweden is (Northstream, 2001).

CO-OPETITION MODELS

Patterns of co-opetition and different models for describing and analyzing co-opetition have been addressed in several papers. Different types of co-opetitive relationships between competitors are described in (Bengtsson and Kock, 2000). In this model the relationships are characterized as being cooperation dominated, equal or completion-dominated.

(Lou, 2007) characterize co-opetition in terms of intensity and diversity. According to this model four different situations can occur depending on if cooperation and competition are weak and/or a strong. In the same way four different situations describing diversity will result depending on the number of co-opetition markets where an actor is present and on low/high number of global rivals on these markets.

In (Gnyawali, He and Madhavan, 2008) a framework is described where co-opetition occurs with (very) high intensity (e.g. a dyad) or with lower intensity between the partners. Another framework is presented in (Gnyawali and Park, 2011) including the following aspects: drivers and dynamics of co-opetition, the co-opetition capabilities of the involved partners and the outcomes of co-opetition.

CO-OPETITION ASPECTS AND MARKETS RELATED TO THE CASE OF MOBILE OPERATORS

The literature on co-opetition covers many cooperation aspects, types of actors, industries and markets. Hence it is illustrative to highlight the key characteristics of the mobile operator business and markets in the developed world. Mobile operators compete on a national telecom market with a few other actors, i.e. an oligopoly. The operators make long term investments in networks and customers and provide mobile services, usually with zero marginal cost.

Hence, it is not without risk to “directly” apply different models and frameworks that are developed to analyze co-opetition for R&D and manufacturing of physical products. Co-opetition between very large global companies developing and manufacturing electronics e.g. (Lou, 2007), (Gnyawali and Park, 2011) can be different from mobile operators offering services at a national market.

However, there are many other examples where the analysis models, analysis aspects and type of market are relevant “as is” even if the conditions are different. When it comes to drivers and obstacles for co-opetition strategic alliances are discussed in (Perks and Easton, 2000). One motivation for a strategic alliance with a competitor can be to “allow them to compete better against third party competitors”, this is highly applicable for network sharing.

Tensions due to unstable or changing market conditions are discussed in (Luo 2007) and (Park and Russo, 1996). For network sharing a number of tensions can be identified although this type of co-operation is long-

term characterized by stability. One potential cause of tension is if one partner want to improve its own market position by getting a greater share of the jointly created value resulting from the cooperation (Ritala and Hurmelinna-Laukkanen, 2009).

One form of co-opetition within an oligopoly is analyzed in (Roy and Yami, 2010). The case describes the introduction of a disruptive technology (an access card with unlimited access) in the French movie theatre sector. Other markets with few large actors, the dairy industry in Finland and the brewery industry in Sweden, are described and analyzed in (Bengtsson and Kock, 2000). Their analysis, of what kind of activities that are shared and not, is interesting to compare with the cases of network sharing in this paper.

These findings are also related to the value network configuration for mobile operators that are used in (Andersen and Fjeldstad, 2003). Three main groups of parallel activities: marketing and contract management, service provisioning and infrastructure operation. The network sharing cases to be described in this paper include close cooperation in the infrastructure operation part and very fierce competition in the two other areas.

RESEARCH APPROACH AND DATA COLLECTION

ANALYSIS APPROACH

For the interaction between market actors and the involved economic processes we use basic ideas from business network research concerning processes (Håkansson and Snehota, 1995 and 1998) and structure (Johanson and Mattsson, 1992). We complement this by discussing the value proposition, the firm organization and value chain, and the position of the firm in the value network (Chesbrough and Rosenbloom, 2002), (Markendahl, 2011).

With this approach separate activities, responsibilities and use of specific resources could be identified. This type of analysis provided input to the design of maps showing the distribution of activities among actors. Often the activities belong to certain groups of responsibility. Examples are activities like network planning, survey of site locations, site construction and installation that is part of the activity group network deployment. Another activity group can be management of SMS tickets that includes ticket issue, ticket delivery and ticket validation. The actors perform certain activities using some type of resources. The control of a resource and the responsibility for the related activities are often closely linked.

The business analysis is focused on the cooperation aspects and the relations between the actors in the network of actors that provide different mobile services to end-users. The analysis will provide insights about the following aspects (Markendahl, 2011):

- What activities that are included in the value network and how they are configured.
- What activities, roles and actors that provides a certain type of value.
- The distribution of activities and responsibilities between actors.
- The interaction patterns between different actors providing the service.
- The type of relation between end-users and different providers.
- What actor(s) that seem to be dominant and possibly organizes the network.

COLLECTION OF PRIMARY DATA

The analysis is based on data collected at a number of interviews made during the period 2009- 2012 with telecom vendors, mobile networks operators, networks sharing companies, and payments solution providers . The work has been pursued in a number of projects funded by the Swedish Agency for Innovation Systems (Vinnova)² and by the research center Wireless@KTH³.

The input data is organized in four different groups depending on the main theme for the interviews:

- Network deployment challenges MBB from a network and service perspective
- Drivers and strategies for network sharing in Sweden 2000-2012
- Network deployment strategies, regulation and investments in India
- Actor cooperation for mobile payment services in Sweden

Network deployment challenges from a network and service perspective

A number of meetings were organized during 2009-2010 in order to discuss challenges related to deployment of mobile broadband networks. Network deployment and spectrum allocation aspects have been discussed in depth with representatives for the operators Tele2 and TeliaSonera. The views of the manufacturers of network equipment: Ericsson, Nokia-Siemens Networks and Huawei have been discussed at a number of meetings. Deployment and network sharing has also been discussed with Ericsson in Denmark (Markendahl, 2011).

Profitability of mobile broadband services has been discussed with representatives from mobile business and research & innovation (R&I) departments at TeliaSonera and with representatives for Ericsson mobile broadband development. The same aspects have been discussed with a representative for technology marketing at NokiaSiemens Networks. These meetings did focus on the operator profitability issues and to get feedback on the initial results presented in (Markendahl et al, 2009).

Input on pricing, usage and customer satisfaction of mobile broadband was collected by doing interviews with a pricing strategy expert at TeliaSonera, with the Swedish Consumer Bureau for Telecom, TV & Internet (KTIB) and with the project leader at the Swedish Telecom regulator PTS for survey of individuals. The objectives of these surveys are to provide information about the market from a consumer perspective including usage patterns, pricing and customer satisfaction.

Drivers and strategies for network sharing in Sweden 2000-2012

One set of interviews were made in 2010 with representatives for mobile operators Tele2, TeliaSonera and Telenor in order to collect *experiences of 10 years of network sharing in Sweden*. A second set of interviews were done in early 2012 with representatives for the network sharing companies in Sweden that all are joint ventures formed by the mobile operators: Swedish UMTS Network AB (SUNAB), 3G Infrastructure (3GIS) and Net4Mobility (N4M).

The questions were about drivers for sharing, how it started, what kinds of activities that have been part of the cooperation (and not) and finally the lessons learned from the cooperation.

Network deployment strategies, regulation and investments in India

The mobile communication market in India is very different to the situation in Europe. During a trip to India in February 2012 a number of meetings were organized in order to capture an understanding of the Indian telecom market. We met representatives of three major mobile operators: Bharti Airtel, Idea Cellular and Reliance Communications, and the largest independent tower company GTL Infrastructure.

² Projects “Affordable Wireless Broadband Access”, <http://wireless.kth.se/publications/ongoing-projects/88-affordable-wireless-broadband-access>, “Force” (on mobile payments) and “Mobile Payments – Not only Transactions” (MBT-MBT)

³ “The significance of spectrum on operator businesses, implications on capex and profitability” <http://wireless.kth.se/SoB/>, “The Mobile Broadband Project Phase 3: More for less”, <http://wireless.kth.se/research/projects/152-mbb>, and the project “Trusted Service Management- a Multitude of Multitudes (TSM MoM), http://wireless.kth.se/TSM_MoM/

We also had meetings with telecom manufacturers, telecom analysts and with advisors at the Ministry of Communications & IT and the Telecom Regulatory Authority of India (TRAI). In total we had 14 meetings/interviews about the Indian telecom market. The questions were about the existing regulatory and business landscape and actor cooperation. We also tried to analyze operator and regulator strategies for the expected “boom” of wireless broadband.

Actor cooperation for mobile payment services in Sweden

In Sweden and Europe mobile payments based on SMS tickets and transactions have been in use since ten years. A first set of interviews were conducted in 2009-2010 with mobile operators, payment solutions providers and with users of mobile payments, e.g. local transportation companies and parking operators. The emergence of new types of actors and new types of cooperation up to 2010 has been reported in (Markendahl, 2011) and (Andersson, Markendahl, Mattsson, 2011).

During 2010 and 2011 the situation for SMS payments changed due to the implementation of the EU-Commissions d in the regulatory framework handled by the Swedish Financial Inspection (FI). In short, mobile operators are not allowed to handle any type of payments without having a “license” for financial transactions. This triggered an intense activities by mobile operators, banks and payment service providers in order to comply with the new directive. Hence, we conducted a new set of interviews during the latter part of 2011 and early 2012 in order to examine the strategies chosen by different actors. This includes meetings with mobile operators: Telenor Sweden, Tele2 and TeliaSonera, and with payment solution providers; Payair, PayEx, Unwire and the new operator owned joint venture 4T Sweden.

COLLECTION OF SECONDARY DATA

A background material has been collected from telecom analysts and investor relation reports published by mobile operators. Regarding mobile payments we have studied web sites, white papers and specifications presented by industry associations and organizations like MobeyForum, NFC Forum, GlobalPlatform, GSM association (GSMA) and European Payment Council (EPC).

The service offers and pricing of mobile operators have continuously been monitored in order to provide a picture of the competitive situation for mobile broadband services. In summary, the Swedish operators offer the same type of service performance at the same price levels. Still the operators competes claiming that “their network” provides the highest data rate, best availability, etc., see e.g. pp 69 (Markendahl, 2011).

OPERATOR COOPERATION AND NETWORK SHARING

Various forms of cooperation between mobile operators have existed for many years. National and international roaming and mobile virtual operators (buying capacity from another operator) are established examples. When 3G systems were introduced in Europe after the year 2000 cooperation between 3G operators was discussed and considered by most operators in Western Europe. In many countries sharing agreements were signed and operators started to deploy and operate shared networks. In this section we describe the development of network sharing in Sweden and a brief description of distribution of roles and responsibilities (Markendahl, 2011).

THE DEVELOPMENT OF SHARED NETWORKS IN SWEDEN

In December 2000 four 3G licenses were awarded. Two of the operators had existing GSM services, Tele2 and Europolitan (later Vodafone and Telenor). Two were entrants at the Swedish market, 3 (Hi3G or Hi3G Access) and Orange, but Orange did not deploy any network why the 3G license was returned to the Swedish regulator PTS and the spectrum later allocated to the other licensees. Europolitan and Hi3G formed a joint venture and started the network company 3G Infrastructure (3GIS). Network sharing was allowed under the condition that the operators provided own dedicated networks for at least 30% of the population. The results was that Hi3G and Europolitan did build both an own network and a shared network. The operators also agreed that users of Hi3G could roam into the 2G networks of Europolitan in areas where Hi3G did not provide any 3G coverage. This agreement was terminated in 2008.

The largest mobile network operator, the incumbent TeliaSonera, did not get any 3G-license. However, the two competitors Tele2 and TeliaSonera decided to build a common 3G network using Tele2's license. The two companies formed a joint venture called Svenska UMTS Nät AB (SUNAB) for planning and building a new 3G network. Both operators continued to run their own GSM networks.

In April 2009, Telenor and Tele2 announced an agreement to form a joint venture called Net4Mobility for deployment of a "4G" network using LTE technology. TeliaSonera had decided to build its own 4G network and therefore not interested to expand its cooperation with Tele2 to include LTE. TeliaSonera launched the first commercial LTE network in the world in July 2010. And by 2012 TeliaSonera, Tele2 and Telenor all market and offer 4G mobile broadband services.

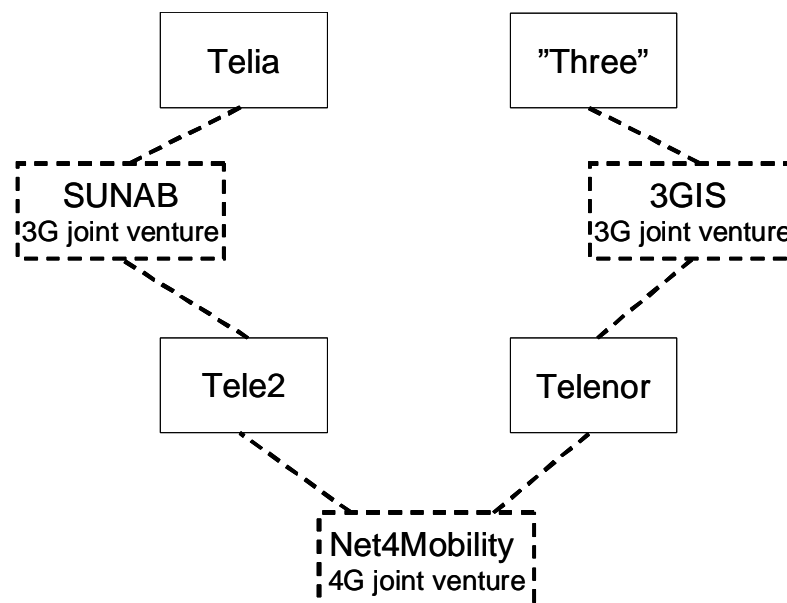


Figure 1 Mobile operators and joint ventures for 3G and 4G networks in Sweden

DISTRIBUTION OF ROLES AND RESPONSIBILITIES

Networks can be shared in a variety of ways, both technically and business wise, see (Village et al, 2002), (Beckman and Smith, 2005). The configuration of business roles of the involved actors in the Swedish network sharing companies is different compared with the two joint ventures. Telenor and Hi3G in addition to the shared network operated by 3GIS also run their own 3G networks. Hence, there are three separate networks, see figure 2. Telenor, Hi3G and 3GIS all have their own network planning groups. 3GIS has no own end-users, as they just provides capacity to Telenor and Hi3G.

The cooperation between TeliaSonera and Tele2 is slightly different to the case of Telenor and Hi3G. There is only one 3G license, the one awarded to Tele2, and one 3G network. Tele2 and TeliaSonera are both owners and customers of SUNAB, but they are also suppliers. SUNAB does not have their own network planning group, but rather uses resources of Tele2 and TeliaSonera. In each of four geographical areas one of the operators is responsible for the network planning and deployment. Each operator also has its own Network operation center (NOC) for monitoring and control of the network.

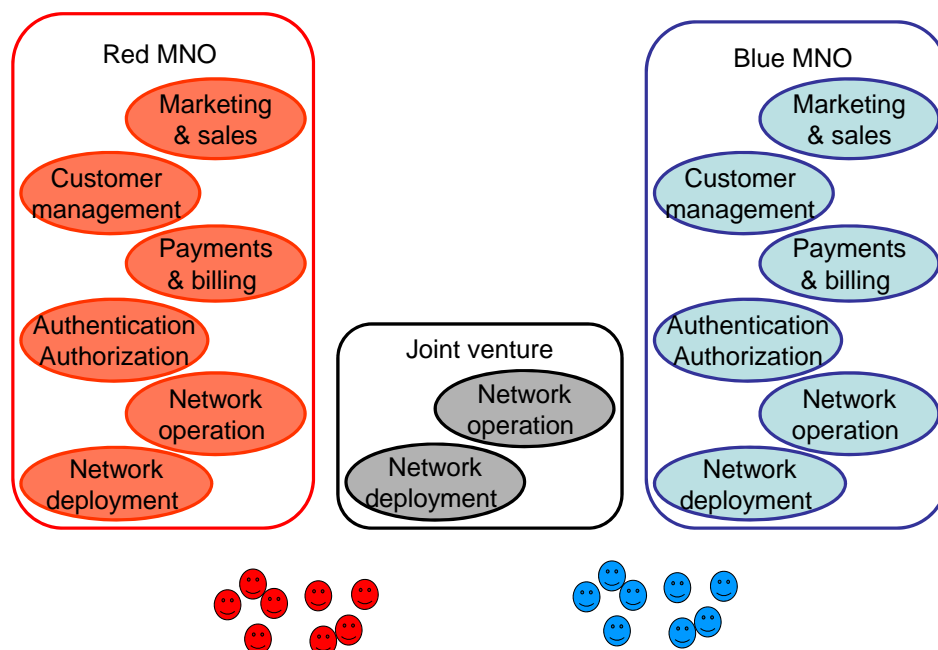


Figure 2 Example of distribution of roles among operators, the case 3G networks provided by Hi3G and Telenor

For all network sharing cases the involved mobile operators compete for end-users. All resources for marketing, customer relation management, billing are controlled by the separate mobile operators. It is only activities related to planning, deployment and operation of the mobile networks that are done jointly. Traffic data and user statistics of each operator is not available to the sharing partner.

The “control of own customers” used for network sharing is the same as for other types of cooperation where operators share network resources, i.e. national roaming and Mobile Virtual Network Operator (MVNO). A MVNO does not have their own access network but rather cooperates with a mobile operator that provides network capacity. National Roaming is a cooperation strategy where a subscriber of one mobile operator is able to obtain services from another mobile operator in the same country, anywhere, or on a regional basis. National roaming is one way to implement network sharing, so called geographical split, where the sharing partners deploy network in specific areas and allow roaming. This was proposed in both UK and Germany for the roll-out of 3G. National roaming is often discussed as a way to lower the barriers of entry for new operators.

ANALYSIS OF NETWORK SHARING IN SWEDEN

The following section includes both the description of the view of mobile operators 2010 (after a decade of network sharing) and the situation in 2012 with the new cooperation landscape, where operators are involved in multiple joint ventures with different partners. During 2012 two new 4G networks are being deployed and the market situation seems to have been stabilized, marketing is ongoing and 4G access services are provided in the major cities.

FINDINGS FROM INTERVIEWS ABOUT NETWORK SHARING IN SWEDEN

Interviews were done in order to collect experiences from 10 years of network sharing in Sweden. The questions focused on drivers and benefits of network sharing and what kind of problems that could be identified. It turned out to be a common view on network sharing from the interviewed persons, although the input is collected from both network sharing companies and three different operators and different parts of the operators' organizations. The description is based on (Markendahl, 2011) and complemented with interviews in 2012.

Implementation of sharing agreements

In both the cases of SUNAB and Net4Mobility the involved operators have three distinct roles. Besides being owners and customers of the networks services the operators are also suppliers to SUNAB and Net4Mobility for the planning, building and deployment of the networks. The SUNAB network is divided in four geographical areas, where TeliaSonera and Tele2 are responsible for planning and deployment in each of the two areas. The agreement includes incentives for the operators to build at the lowest possible cost while maintaining a predetermined quality. The same approach with area responsibility is used for Net4Mobility.

In order to cooperate with a competitor there needs to be a common short and long term strategy. This includes deployment plans, investment plans, specification of network features and how to manage existing sites. It is seen as difficult to exit a sharing agreement, even though conditions for an exit are included in the agreement. The sharing partners have to agree on several aspects, like for example:

- How much of the network should be shared?
- How to share costs for investments and utilization of the network?
- How to make decisions for network expansion and upgrades?
- How to handle situations where only one partner wants to build out network capacity or coverage?

Drivers for network sharing

Reduced network costs are an obvious driver. At the interviews a number of other aspects related to network sharing were also mentioned: The market position of the sharing partners, the number of new sites that needs to be deployed, the cost structure of the network and the availability of spectrum. For a small operator or a new entrant it can be beneficial to have an established operator as a partner. The new partner can obtain access to the brand, network competence, existing sites and transmission with backhaul. There are a number of observations of network sharing that can be made on a strategic level.

- Sharing was the only feasible solution to enable a cost efficient deployment to fulfill the coverage requirements stated in the 3G licenses in Sweden.
- For the largest operator TeliaSonera, network sharing was the only way to enter the 3G business since they did not get any 3G license.
- The motivation for sharing was not entirely related to the 3G network and 3G services. From the interviews it is clear that all operators wanted to protect some part or all of the existing business. Hence, the key question was if the operator would apply for a license and enter the 3G business at all. The network sharing was one way to do this in a cost efficient way.

However, it was not obvious that the existing GSM mobile operators should enter the 3G business and build 3G networks. A representative for one of the operators stated:

"One option for us was to focus on voice services and continue with GSM"

Lessons learned

At all interviews the lower degree of independence was mentioned as a critical issue. The operators do not have full control over the network strategy and investments. The decision making on investments is slowed down, it takes more time and efforts. The savings in network CAPEX is easy to estimate while it is more difficult to estimate the "cost" for the loss of independence when it comes to network strategies. *"hence, you should not believe that network sharing is an easy way to save costs"*.

At the same time many benefits of the sharing can be identified. In the SUNAB case the cooperation did work very well during the first six years when the network was deployed. SUNAB seems to have worked well as a neutral actor that can balance different interests. The conditions in the sharing agreement are explicit, more traffic by one operator leads to higher fees. SUNAB has strict control of the traffic and usage and generates data for the charging of the operators.

One risk with outsourcing of network deployment, operation and maintenance to a third party is that the own organization will lose competence. In the long term this may reduce the ability to make strategic network decisions. The cooperation between TeliaSonera and Tele2 was reported to have been beneficial when it comes to network competence and experience. Both companies have learned from each other. The cooperation at the technical level works fine as long as the market and strategic issues are handled at a higher level.

CHANGED CONDITIONS FOR NETWORK SHARING

Comparing drivers for network sharing 2000 and 2010

When we compare the situation and need for network sharing in the years 2000 and 2012 we can see significant differences as illustrated in table I.

Parameter	2000	2010
User demand	User demand was quite low	Need for capacity is increasing
No base station sites	Need for many new sites	A lot of existing sites
Cost of radio equipment	Radio capacity was expensive	Radio costs has decreased a lot
Need for radio spectrum	No shortage of spectrum	More spectrum is allocated

TABLE I. COMPARISON OF NETWORK SHARING IN SWEDEN 2000 AND 2010

- **User demand.** In the year 2000 there was no demand for mobile broadband services. It was unclear to the operators what kind of "3G services" that would be offered. In Sweden, the operator Hi3G initially focused on video calls. In the year 2010, when the first 4G networks were deployed the situation was different. There is a obvious demand for mobile broadband access for both smart phones and laptop modems (dongles). Customers are familiar to mobile broadband services and use of Internet services in handsets.
- **Density of base station sites.** In the year 2000 a new 3G network was deployed with a large number of new base station sites as more than 99,9% of the Swedish population had to be covered. Due to the higher carrier frequencies at 2.1 GHz denser networks than the existing GSM networks at 900 MHz were needed, requiring massive capital investments. In Sweden network sharing has contributed to that the operators could deploy a large number of sites and meet the license requirements. This has resulted in extensive coverage for the 3G networks. The site density in office areas can be 10 – 40 sits per km², in downtown Stockholm the site density is above 100 sites per km². This means that future deployment of "4G networks" (LTE) to a very large extent can be based on re-use of existing base station sites.

- **Cost of radio equipment and transmission.** The cost for radio equipment has decreased dramatically during the period 2000 to 2010⁴. The capacity to cost ratio has improved more than an order of magnitude within a few years. The transmission capacity was not a bottleneck in the year 2000, the capacity could e.g. be provided by 2 Mbps leased lines. In order to meet the capacity demand in the year 2010 the transmission to sites need to be upgraded, in many cases with optical fiber connections.
- **Spectrum availability.** The access and control of radio spectrum is extremely important for mobile operators. More radio spectrum means that more capacity can be offered for a fixed number of sites, while less spectrum implies more sites and therefore higher costs. More radio spectrum also means that higher data rates can be offered, which is vital for the competition between operators.

All these changes imply that the drivers for network sharing have changed dramatically. Operators can deploy new networks at a considerable lower cost than before. This is due to the lowered cost for radio equipment and that costs for new sites can be avoided, this is explained in more depth below.

Changing cost structure and role of radio spectrum

The intense competition among network and radio equipment manufactures has pushed down prices during the last couple of years. This enables operators to replace existing radio equipment with new equipment (LTE) for only EUR 10K per base station. This is an approximation of the market price supported by statements by TeliaSonera and Ericsson. The first indication of these price levels was communicated in 2009 when Telenor signed an agreement with Huawei for the replacement of approximately 6000 base stations for EUR 63 million⁵. The cost-capacity ratio has improved more than 20 times in just a few years, see figure 3. The most recent base station equipment supports multi-standard solutions, e.g. GSM, WCDMA and LTE⁶, further improving the cost efficiency.

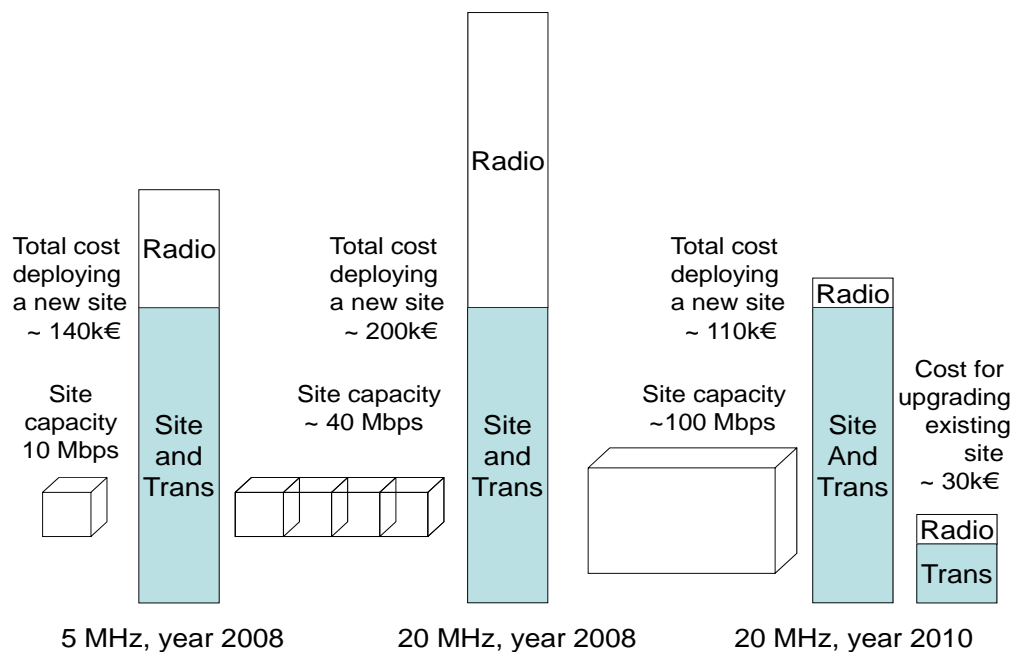


Figure 3 Site capacity and deployment costs, based on assumptions of 3 sector sites and cell average spectral efficiency of 0.7 bps per Hz (using HSPA year 2008) and 1.7 bps per Hz (using LTE year 2010). Source: Authors' calculations (Markendahl, 2011)

⁴ http://www.ericsson.com/thecompany/investors/financial_reports/2009/annual09/resultsrisk-factors-market-technology-and-business-risks.html

⁵ <http://www.telenor.com/en/news-and-media/press-releases/2009/telenor-to-replace-its-infrastructure-for-mobile-services-in-norway>

⁶ An example (NSN): <http://www.nokiasiemensnetworks.com/portfolio/products/mobile-broadband/single-ran-advanced/flexi-multiradio-10-base-station>

It is, however, not the cost of the radio equipment that is the key issue. As illustrated in figure 3 the dominating component in the cost structure of radio access networks is cost associated with the base station sites. This includes costs for towers or masts (civil works), non-telecom equipment, power, installation, and site lease. The capacity is related to the amount of radio equipment, but the main cost driver is the amount of new sites that needs to be deployed. More radio spectrum means that operators can re-use existing sites and hence exploit previous infrastructure investments. This is also a key aspect when network sharing between operators is used.

Large amounts of radio spectrum is always beneficial due to capacity and cost factors, more traffic can be served and existing sites can be re-used. For the initial versions of 3G systems the offered data rate was the same, but this has changed. Recent 3G systems and the 4G systems have the capability to increase the data rate depending on the bandwidth. Using so called band aggregation the bandwidth and data rate can be increased by combining different spectrum bands, e.g. 800 MHz, 900 MHz, 1800 MHz and 2600 MHz, see (Markendahl and Mölleryd, 2011).

This means that cooperating operators that control more spectrum than their competitors can offer higher data rates and hence have a “better” offer. We believe that this very important since operators put a lot of attention to the network performance in terms of data rates and coverage. This can be observed by the information at the operator web sites, see e.g. pp 69 (Markendahl, 2011).

As an example, consider the case of the 2600 MHz band in Sweden. Operators TeliaSonera, Telenor and Tele2 all have 200 MHz whereas operator “3” has 10 MHz. In addition Telenor and Tele2 share networks and combine their spectrum resources. Hence, they can claim that they have a better offer.

This last observation is interesting from a value proposition perspective. Network sharing started as a cost-saving strategy, the value proposition to end-users was unchanged regardless if sharing was used or not. However, now network sharing where radio spectrum is combined will have an impact on the service offers and the market position.

NETWORK SHARING IN THE FUTURE

The Swedish operators consider network sharing to be very important for the future. One operator claimed that network sharing will be required in Sweden in order to deploy and operate multiple 4G networks outside Stockholm if current price levels are to be maintained. Without network sharing in Sweden it may be that just one operator can operate multi-radio networks outside the major cities.

This will have a substantial impact on competition and end-user prices. Hence, regulators should consider network sharing in order to ensure competition for mobile broadband access services.

When it comes to competition, the view among the interviewees was that network sharing in Sweden has not had any negative consequences. The competition for end-users and pricing has not been influenced by any agreement among sharing partners. On the other hand, mobile broadband prices are low in Sweden. It was also mentioned that in a country like Sweden, the incentives for future sharing agreements may be lower than before. As mentioned above, the costs of radio equipment has decreased and there exist a large number of sites.

Early 2012, the major part of the mobile broadband traffic is carried by the “old” 3G networks, while the number of 4G customers are still limited. Although a new partnership is formed, the interviews indicate that the 3G joint ventures are believed to maintain an important role during the coming years, especially for coverage outside the major cities.

NETWORK SHARING IN INDIA AND COMPARISON WITH SWEDEN

Network sharing is common in India but it is organized with separate tower companies that owns and deploy base station sites where operators are tenants. This can be explained by a differences in market structure and telecom regulation. In this section, we summarize the characteristics of the Indian mobile communication market and compare network sharing in India and Sweden.

INDIAN TELECOM MARKET IS VERY DIFFERENT TO SWEDEN

A mass market with very low prices

The Indian telecom market is dominated by mobile communication services. More than 900 million SIM cards make it to the second largest mobile telecom market in the world. At the same time the fixed line penetration is just around 3% (35 million) and the total number of broadband connections is 14 million och which 3 million are mobile broadband connections using the 3G services.

The operators and regulators estimate that the number of active SIM cards is in the range 60 – 95 %, with large variations between the operators. Multiple-SIM phones are common enabling the users to shift between 2-3 different SIM cards, hence the users themselves can implement “national roaming”.

Voice services and pre-paid dominates. The average revenue per user (ARPU) is very low and around €2 per month, i.e. 1/10 compared to Europe. The price per voice minute is very low (half a Eurocent) and the number of voice minutes per user and month is high (400 min), considerable higher compared to Europe.

A fragmented market with many operators

The mobile communication market in India differs a lot compared to the situation in Europe. Operator and spectrum licenses are awarded in 22 regions (called circles) and the number of operators in each circle is 10 – 12. There exist state owned mobile operators but none of them are among the largest.

The high number of operators has led to an intense competition and very low prices. After 2008 when new operators entered the market the (already low) voice prices decreased by 60 %. Another issue for operators is the limited amount of spectrum that has been awarded. GSM operators typically have 4,4, 6,2 or 8 MHz in the 900 MHz band, and 3G services operators have been awarded 2* 5 MHz, this is more or less 1/10 compared to the spectrum available for mobile broadband for European operators. Operators pay license fees to the government, a kind of royalty (or tax), around 6-8% of gross revenues

Moreover, the spectrum allocation process is complex and has caused a lot of uncertainty. In early 2012 the India's Supreme Court decided that 122 spectrum licensees that had been awarded at first-come-first-served basis in 2008 should be quashed. The decisive argument was that these licenses had been granted to companies during an arbitrary allocation process. This has thrown the Indian telecom market into a “wait and see” situation where no operator upgrades or invests in mobile networks.

Summary of issues for the Indian telecom market

A summary of issues and challenges at the Indian mobile telecom market would be as follows:

- A voice mass market with high volumes, very low prices and high level of competition
- The market fragmentation with a large number of operators
- A spectrum shortage in general and the spectrum allocation procedure
- Mobile broadband is in a very early stage, smartphones have to come down in price
- The need to deploy mobile broadband in rural areas (with 70% of the population)

NETWORK SHARING IN INDIA

Tower companies

Network sharing is common in India but it is organized in a totally different way compared to Sweden. The operators rent space and some equipment at the base stations sites that are operated by tower companies, see Figure 4 for two different types of base station sites. The operators share the tower, power, cables, equipment room and other non-telecom equipment. it is labeled passive network sharing since no active equipment, i.e. radio transmitters and receivers are involved.

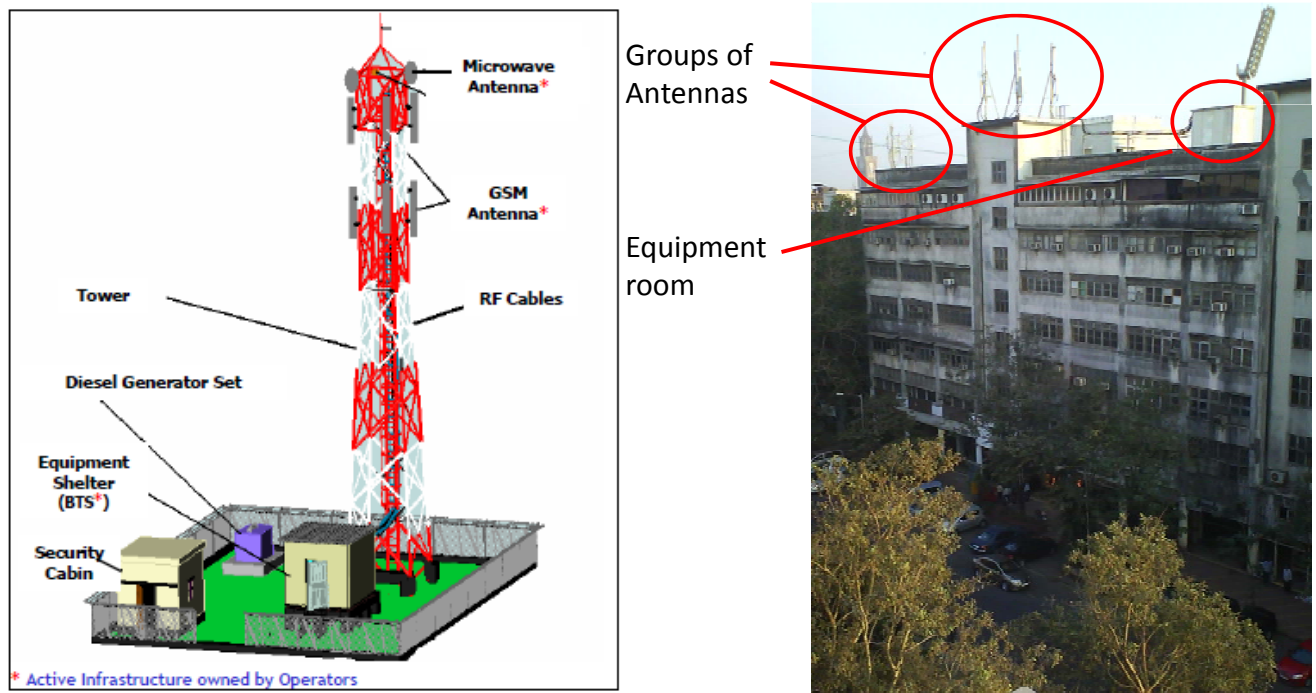


Figure 4 Examples of base stations sites, to the left using a ground based tower (picture: GTL investor info 2011), to the right a rooftop site in downtown Mumbai (photo by authors February 2012)

A key driver for network sharing is to lower the cost base. With tower companies mobile operators can avoid long term investments in costly towers and site equipment. Instead of investing capital for 20-30 years operators are tenants leasing space, capital expenditure is replaced with operational expenditures. The tower companies act as real-estate companies making investments and taking on the risk.

The rental agreements are designed so that the more tenants at a site the lower the cost for each tenant, and at the same time revenues increase for the tower company. The interviews indicate that currently the focus is to increase the number of tenants per site rather than building new sites. In one case the target was to go from “just below two” tenants to around three tenants per site.

Many actors and types of ownerships

There are a large number of base station sites (towers), more than 400 000 in total in India and many tower companies, see figure 5. There are also many different types of ownership structures:

- Owned by a single operator
- Owned by two or more operators
- Independent tower companies

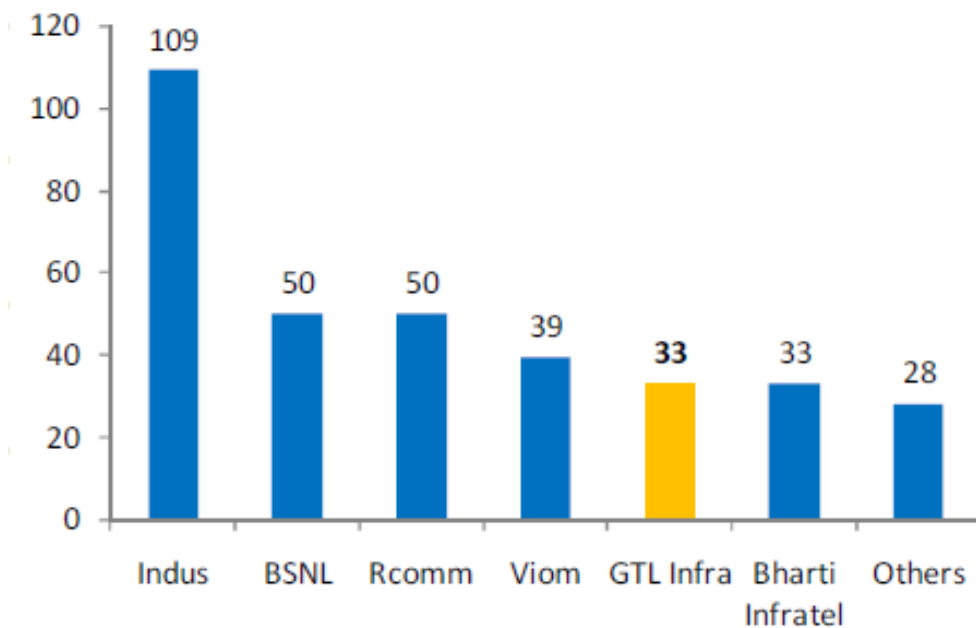


Figure 5 Number of base station sites (thousands) for different tower companies (Source: TRAI)

COMPARISON OF NETWORK SHARING IN INDIA AND SWEDEN

The market structure

The tower companies have different owners, and it can be one or several mobile operators or companies that are not related to any operator. In the same way any operator can be a tenant at any site, see figure 6. This is different to Sweden, where the network sharing joint ventures are self-contained and more closed entities. The owners are the ones that make decisions about network investments but at the same time they are also the main customers and suppliers of knowledge and resources for network planning and deployment, see figure 7.

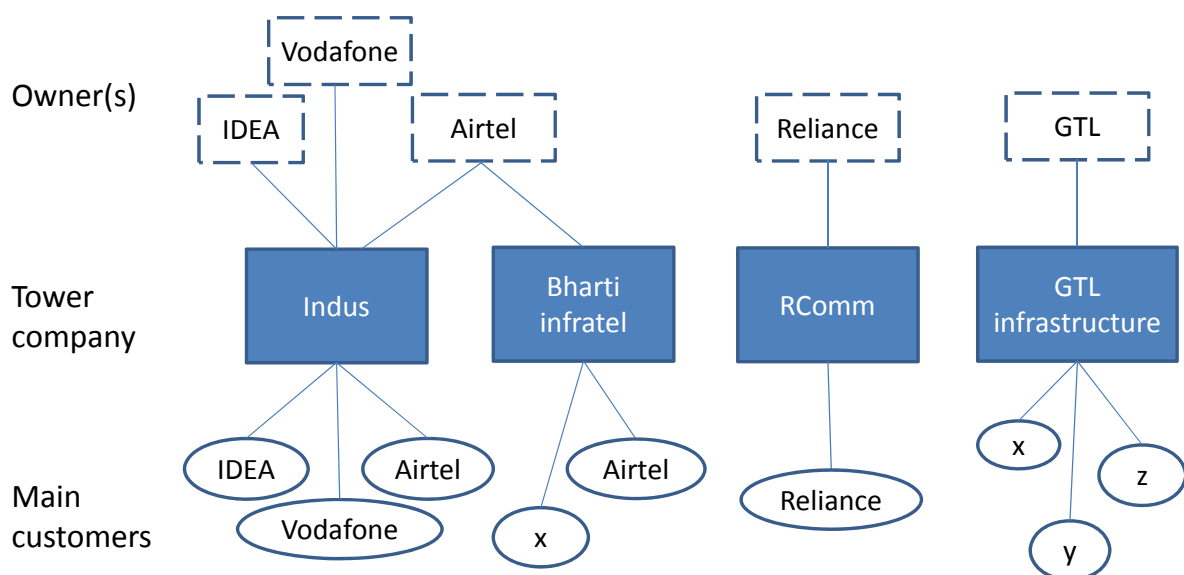


Figure 6 Illustration of market structure with owners and customers for tower companies in India

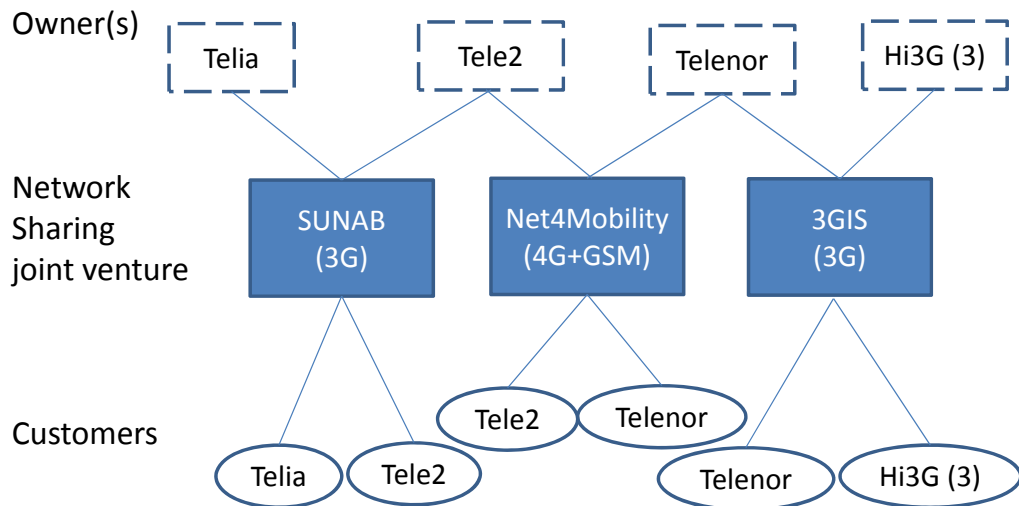


Figure 7 Illustration of market structure with owners and customers for network sharing companies in Sweden

The purpose of the Swedish joint ventures is to deploy, manage and operate the entire mobile networks. To deploy and maintain base station sites is an integrated part of the business. The cooperation is done within the jointly owned networks sharing company, where the owners have to agree on investments and then share the costs and split the work to be done. Other operators or joint ventures are allowed to rent space on commercial terms.

In India deployment and operation of sites is the core business for the tower companies. The operators rent space and pay a fee on commercial terms, regardless if the tenant is an owner or not. The operators place their active equipment in the sites and can control the networks⁷. The cooperation is implemented using an independent actor. The decisions to build new sites are taken by the tower companies.

What kind of sharing is allowed and not

In Sweden operators are allowed to share sites, non-telecom and radio equipment and also radio spectrum. This has been used by the network sharing companies leading to a high degree of cost efficiency for the 3G networks; and the radio capacity has been built out when needed.

In India, the situation is totally different. Until now, active sharing has not been allowed. However, according to the new National Telecom Policy 2011 (NTP 2011) active sharing is proposed for GSM operators with the lowest amount of allocated spectrum (2*4.4 MHz). At the same time the proposal in NTP 2011 says that operators have to pay license fees also for the band of the sharing partner. It is believed to effectively prevent operators to enter active sharing agreements.

During the interviews active sharing was discussed in terms of new business opportunities for the tower companies. Since, they own all passive equipment it would be a natural extension to also own active equipment. This would improve the efficiency for the overall system. The mobile operators then could rent also radio equipment, even if the control of spectrum is in the hand of the operators. This is however a topic for future research and regulatory initiatives.

⁷ Note that it is very common in India that the network control and operation of a mobile network is outsourced to some other actor, typically a manufacturer of mobile networks like Ericsson or Nokia Siemens Networks. This adds another dimension to the theme cooperation since the operators cooperate very closely with the providers of the network equipment. These so called managed services are a very large and growing part of business of all network manufacturers.

ACTOR COOPERATION FOR MOBILE PAYMENTS IN SWEDEN

The last decade SMS payments have been used in Europe. In order to provide commonly accepted payment solutions operators, mobile service providers and non-telecom service providers have agreed on a common strategy. This common strategy can then be implemented by any actor.

During 2010 and 2011 the situation for SMS payments changed due to regulatory directives by EU and the Swedish Financial Inspection (FI). This led to a large number of activities by mobile operators, banks and payment service providers in order to comply with the new directives. One result is the formation of a mobile payment joint venture owned by all Swedish mobile operators. In this section we will describe this development of operator cooperation for mobile payment services, first the type of cooperation employed for SMS payments (Markendahl, 2011) and next the foreseen operator cooperation implemented by the joint venture. Finally, we will compare the actor activities and relations for these two types of industrial networks.

SMS PAYMENTS ENABLED BY A COMMON SOLUTION APPROACH

Currently there are many “daily life” activities where SMS based services are used by “non-telecom” service providers like TV companies, shops, parking operators and public transportation companies.

Different types of drivers can be identified for these types of services, e.g.: to establish a closer relation with the customer, to replace cash, to increase user convenience and to increase speed for mass transport ticketing. This so called “mobile consumed content” is ordered by sending a SMS and the payment is done using the mobile phone subscription or a pre-paid SIM card. Businesses that want to use SMS messages for any kind of service; advertising, voting, collection of money, ticketing or payment, are faced with an “eco-system” for SMS services consisting of a number of actors with different types of relations. The following picture has been outlined by several mobile service providers, see Figure 8.

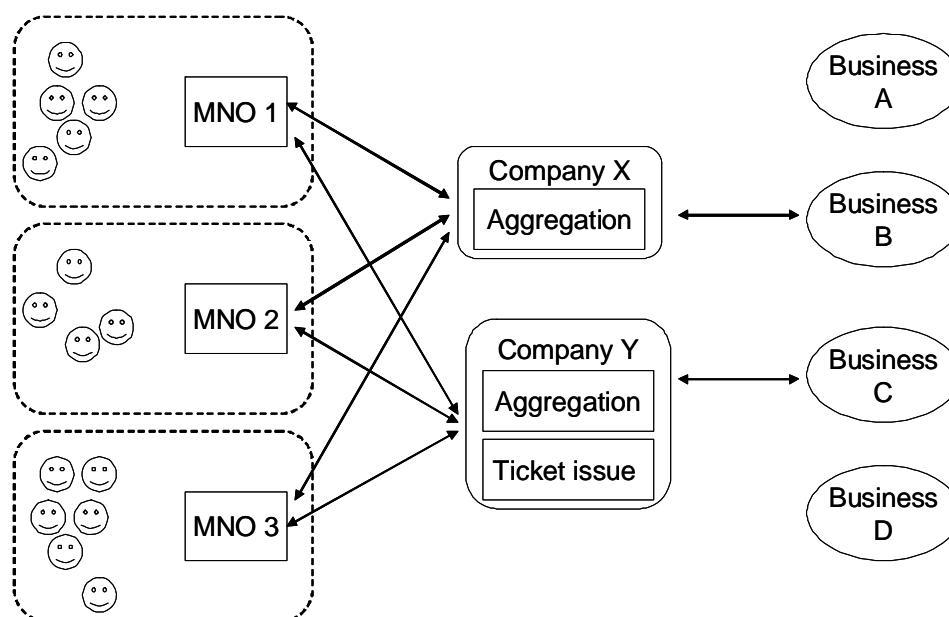


Figure 8 Generic picture for actors involved in provisioning SMS services (from Markendahl, 2011)

On one side we have the end-users who have subscriptions with a specific Mobile Network Operator (MNO) and on the other side we have the businesses that want to use SMS services. In between, in addition to MNOs, there are so called “aggregators” that aggregate SMS traffic from all operators. An aggregator has two types of relations with a MNO. First, there is a technical part consisting of connections to carry the traffic. Second, there is a business related part where the partners have agreed on prices for a given volume of SMS traffic and, in case that the phone subscription will be used for payments, the amount of the service fee (per cent) that the MNO puts on top of the sum charged to the end-user mobile subscriber. The aggregators can be seen as MNO’s “customer” since they act as wholesalers that “buy” SMS traffic from the MNOs. The SMS messages are then “sold” to various businesses who offer SMS services to their end-users.

A business B that wants to market and sell a SMS based service contacts aggregator X who will be in charge for the SMS service of Business B. Business B wants all customers to use the same number for the service regardless of who the end-user's MNO is. In Sweden different MNOs own specific sets of numbers to be used for SMS services. However, the Swedish operators cooperate on these issues so the aggregator X "on behalf of Business B can agree with all MNOs that a specific number is used for the SMS service. When the SMS service is launched the set of activities can be:

1. A subscriber of MNO1 sends a SMS in order to use the service provided by the Business B;
2. The SMS is directed through the network of MNO 1 to Aggregator X;
3. When the SMS is identified as a "Service SMS" the Aggregator X checks with MNO 1 that the user account (or pre-paid SIM) can be charged;
4. If the account can be charged MNO 1 sends OK to aggregator X and then MNO1 charges the user subscription the cost of the Business B service + the price of the SMS + the service fee
5. The "approved" SMS is forwarded by aggregator X to Business B that starts to process the service request, sends a confirmation and, if applicable, any content related to the service.

The SMS service can be managed by different actors; e.g. by the Business B, by the company acting as aggregator or by an independent company. For transportation and parking services a "SMS ticket" needs to be produced and delivered to the phone. In addition to the aggregation, use of SMS tickets requires support for ticket issue, delivery and validation features. This is illustrated in Figure 8 where the business C uses company Y for provision of both aggregation and SMS ticketing services. In the Nordic countries companies like Plusdial and Unwire offer such services.

MOBILE PAYMENTS OFFERED BY A SPECIALIZED PAYMENT SERVICE PROVIDER

In November 2011 the Swedish mobile operators TeliaSonera, Tele2, Telenor and 3 (Three) announced that they have formed a joint venture for mobile payment services⁸. The new company called 4T Sweden plans to launch a mobile wallet by mid-2012 which will allow Swedes to pay for services such as public transportation and parking. In January 2012 4T Sweden decided to base the payment service on solutions from PayEx and Accumulate⁹. The account holding and infrastructure services will be developed and operated for 4T by PayEx and the mobile wallet application solution and the mobile security are based on Accumulate's mobile security platform.

In February 2012 4T Sweden launched the name of the service – *WyWallet*. The mobile wallet service will be the same from all operators giving the end users the same payment options and look and feel independent of operator used. The mobile payment service will be an alternative for cash and card payments and will cover several payment situations; point-of –sales purchases, person-to-person, online payments and man-to-machine applications (e.g vending machines, parking meters). Users can load their wallet accounts using an internet bank or transfers from credit card accounts.

4T Sweden claims that this type of cooperation is unique, such cooperation between leading mobile operators cannot be found elsewhere in the world¹⁰. The marketing manager of 4T Sweden says "Currently we are contacting merchants that may be interested in our payments services ".¹¹

⁸ <http://www.nfcworld.com/2011/11/21/311386/swedish-mnos-form-payments-joint-ventur/>

⁹ <http://www.nfcworld.com/2012/01/17/312467/swedish-carriers-pick-mobile-wallet-suppliers/>

¹⁰ Authors translation from press release: http://wywallet.se/press/WyWallet_2012-02-24.pdf

¹¹ <http://www.dagenshandel.se/dh/dagensh.nsf/0/6E005782C8743DF9C12579B20039ED67?open>

ANALYSIS OF ACTOR ACTIVITIES AND RELATIONS

The differences between the SMS payment approach using aggregators and the case 4T Sweden are highlighted if we compare the market maps with actor activities and relations. For SMS services the operator has the customer and billing relation with the end users. The aggregators act on behalf of the merchants/service providers and are usually not visible for end-users, see Figure 9. When users send service requests by SMS these are processed by the aggregator resulting in charging requests to the operators of the user. If this is Ok the user account is charged and the payment is initiated. The aggregator has business relations with the merchant/service provider but in some cases large service providers, like public transportation companies, have special service fee agreements with the operator.

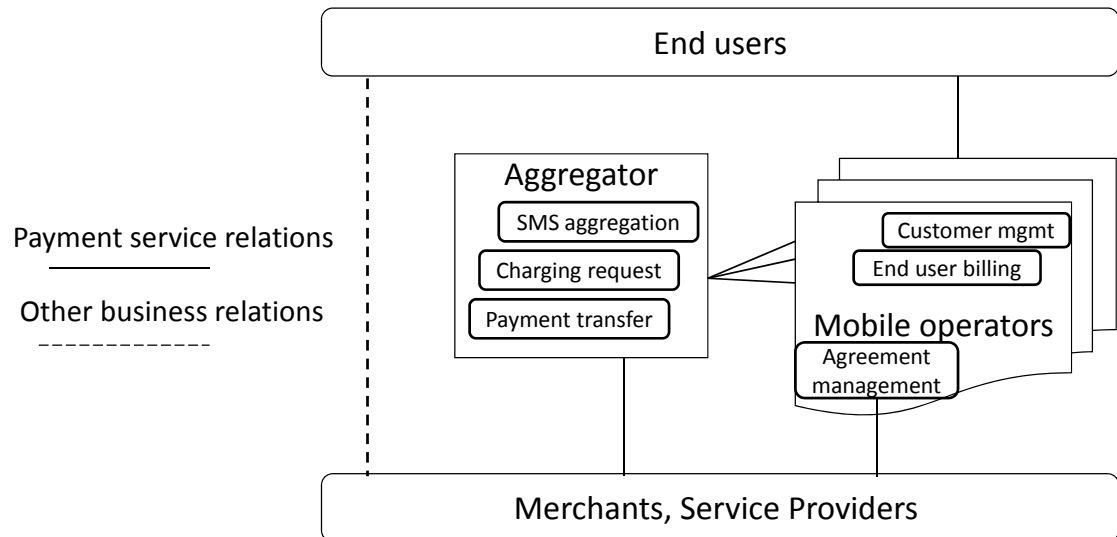


Figure 9 Actor activities and relations for SMS payments using an aggregator

With the entrance of 4T Sweden the actor map will change. Users have to register for the WyWallet service but can use existing credit card or bank accounts to fill the mobile wallet. 4T Sweden have to market their service both to consumers and businesses that would like to make use of the service. If successful 4T Sweden will be a key actor having the relations with both consumers and business and also handling the payment streams. Operators are not involved in the payment services, Figure 10.

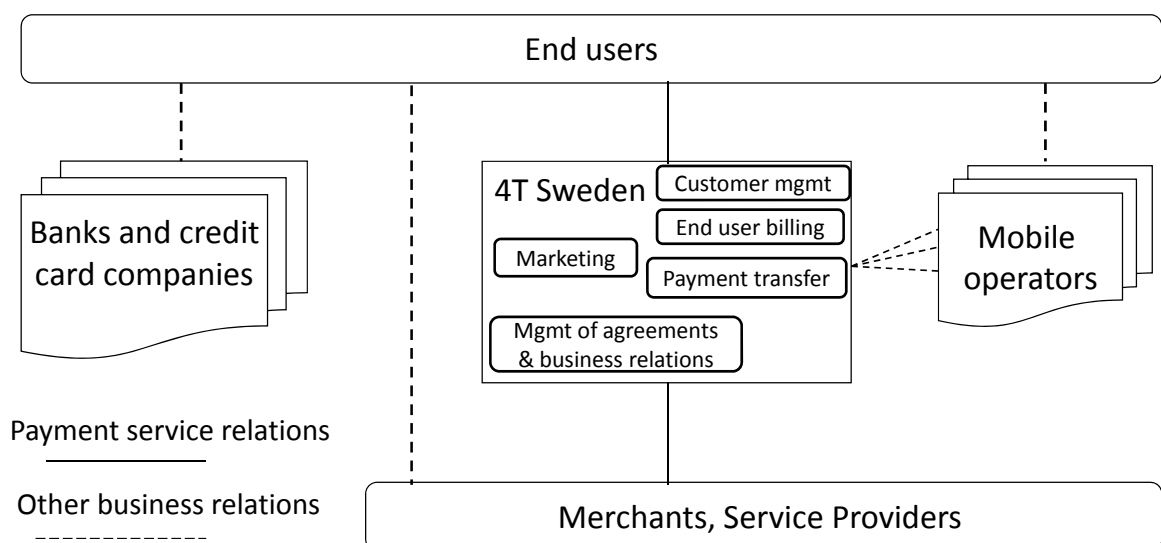


Figure 10 Actor activities and relations for the case mobile payments using 4T Sweden

DISCUSSION AND COMPARISON OF CO-OPETITION STRATEGIES

In previous sections we have seen that the concept of co-opetition includes several dimensions like: drivers for cooperation, ownership and the position of joint ventures, the level of co-operation, what resources that are shared, and what actors that have relation with end-users. In this section these aspects are discussed with an attempt to provide a structure of patterns of co-opetition including why and how operators co-operate. First, some observations on cooperative spirit found among Swedish mobile network operators that complements the description in the previous section.

EXAMPLES OF COOPERATIVE SPIRIT

It was mentioned (section 7.1) that Swedish operators cooperate on the allocation of SMS services. The mobile industry organization MORGAN has a code of conduct for mobile payments. This industry organization does not only include operators as it is also gathering companies active in the Swedish mobile service industry. The goal of MORGAN is “to act to create a fair and interesting market for all the players in the mobile value chain”¹².

This type of cooperative spirit can also be found in other areas. Besides the network sharing used for 3G and 4G networks the operators in Sweden have developed a practice of cooperation and sharing of sites. However, this was not at the case when the GSM services emerged in Sweden and the three competing operators did build their own GSM networks. The mobile operators competed intensely for establishing network coverage. For many years coverage maps were presented. The network planning strategy for operators were very sensitive. Especially the locations of the base station sites were considered as company confidential information.

In the first half of the 1990's the operators did not cooperate, and in some cases not even discussed, about sharing base station sites. The operators did all apply for building permits for sites in the same area. The local authorities objected and requested that operators cooperated in order to co-locate sites. From 1995 there were agreements about placement of equipment in each other sites and to share towers, masts, and shelters. In the first place no fees were used, and the sharing was based on mutual utilization of each other's sites. From 1998 the sharing of sites has been made on commercial terms, generating rents.

It seems like the Swedish operators currently work with site deployment in a cooperative spirit also beyond the cooperation within the joint ventures. It is illustrated by the fact that applications for building permits for new sites often include a second shelter for equipment, in case some other operator want to use the same base stations site. In the same way there is an established process for deployment of wireless networks at indoor public locations like railway stations and shopping malls.

A CO-OPETITION DRIVER AND STRATEGY MAP

Figure 11 illustrates the differences between different co-opetition strategies and drivers. On one axis we have the level of cooperation between operators, both including ownership of joint-ventures and how close the cooperation is in terms of shared resources.

The other axis illustrates what actor that has the main relation with the end-user. In all network and tower or site sharing cases the mobile operators have the customer relation. For the mobile payment service the situation is different. For the current SMS payments the key relation is with the actor that provides the actual service, e.g. public transportation or parking. The SMS ticket provider and the mobile operator is more or less not visible to end-users. Finally, the mobile payment joint ventures establish direct end-user relations, the consumers need to register and operators are not involved.

¹² <http://www.morganforum.com/english>

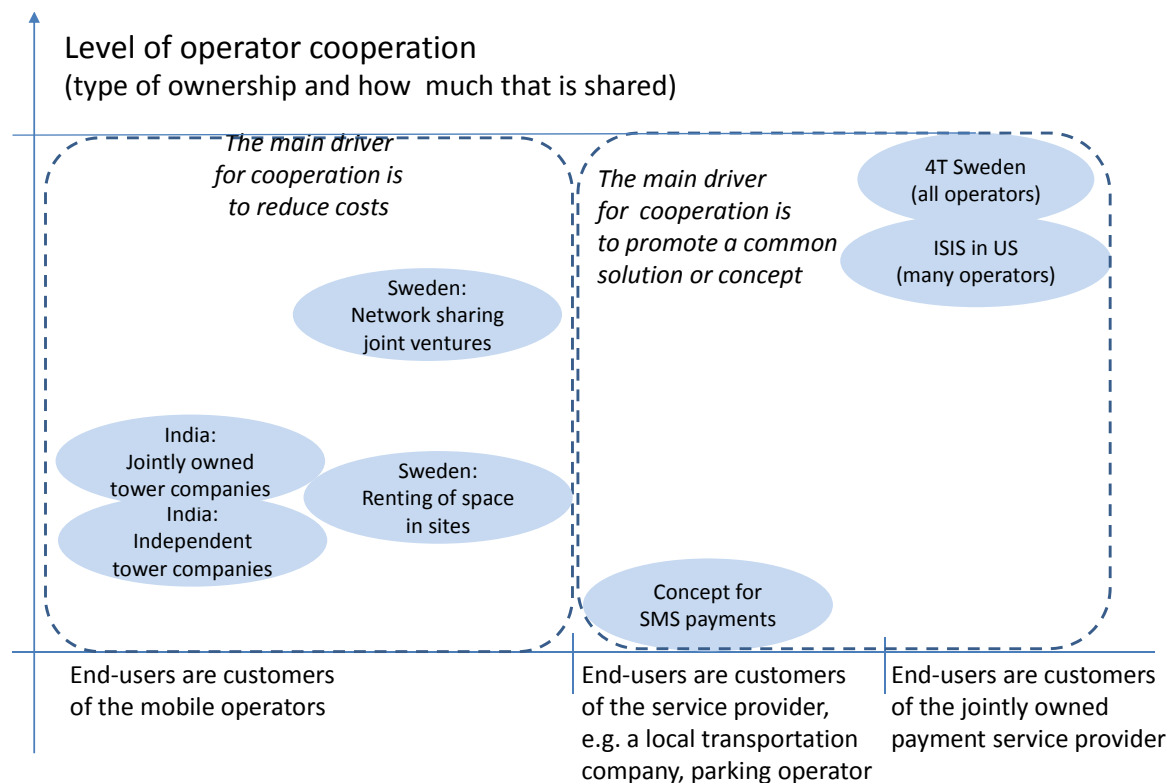


Figure 11 Map of mobile operators' co-opetition strategies in terms of level of cooperation and end-user relations

We can also note a difference when it comes to drivers and obstacles for the cooperation. For network sharing the main driver for cooperation so far is to reduce costs, network opex usually is around 30% of the total operator opex. If spectrum sharing is used it offers higher data rates is a possible driver. In India the regulation of network and spectrum sharing is an obstacle to more extensive cooperation. In Sweden the telecom regulation allows cooperation in the form of network and spectrum sharing.

When it comes to potential “anti-drivers” for cooperation in the form of network sharing one aspect is the more or less identical service offers. At locations where the operators use the same network the network performance in terms of capacity, coverage and data rate is the same. The Swedish operators use minor differences in results from network tests and claim that “we have the best network” and “we offer the highest data rates”. Hence, the use of the same network resource does not prevent operators to compete for end-users using the same marketing logic that was used for GSM services.

On the other hand, in the future network coverage may be seen as a commodity and no longer be a competitive advantage. Customers expect good coverage and hence the operators anyway can cooperate, and the operator differentiation needs to be expressed and highlighted in other areas. The main competition for mobile operators may come from content providers and companies like Google, Apple and Facebook. Network sharing and cost-efficiency may be seen as a necessity in order to preserve competitiveness. In addition, network sharing enables operators to reduce long term investments.

For mobile payment solutions the main driver is not related to cost savings. The operators co-operate in order to promote a common brand, a specific concept or payment solution. Single operator payment solutions will be considered less feasible due to “limited coverage “. Merchants and transportation companies as well as consumers expect payment solutions to be accepted “anywhere” no matter what operator they have. For the mobile operators the driver is to be able to offer a payment solution that can compete with exiting credit card payments and other mobile payment solutions that are offered by banks and payment service providers.

SUMMARY

From the different cases and the discussion in the last section we can draw the conclusion that there is a multitude of aspects, parameters and dimensions that can be considered in an analysis of co-opetition between companies. Several types of frameworks are proposed for analysis. We believe that there is no single “best” framework or conceptual model that can be used to describe and classify different types of co-opetition. Different patterns of cooperation and competition will be identified depending on what perspective and set of parameters are used..

In our analysis we have looked into a subset of all aspects and parameters; drivers, benefits and obstacles, and the type and the level of co-operation, ownership and the position of joint ventures, distribution of resources, activities and responsibilities among actors. Our conclusion based on empirical data is that we can identify four types of cooperation between competing mobile operators.

- **A cooperative spirit**

This type of cooperation focuses on working practices and/or principles for common use of resources or a solution, and the objective of the cooperation is to enable and facilitate that actors can use the resource or solution. Examples are site sharing outside joint ventures and premium SMS services. Agreements are made by separate actors on a case by case basis. Operators cooperate when it comes to infrastructure but compete for end customers.

- **Infrastructure cooperation through a third party**

In this case operators share resources provided by a third party, e.g. a tower company or a SMS aggregator. The objectives of sharing are to reduce costs or to exploit benefits of economy of scale. The operators have agreements with a third party but not with each other. Also in this case operators cooperate on infrastructure but compete for customers.

- **Infrastructure cooperation through a joint venture**

The Swedish network sharing joint ventures are examples where operators cooperate on the infrastructure side have their own service provisioning, customer relations management, billing . and hence fully compete for customers. The owners of the Swedish network sharing companies are also the main customers and suppliers of network planning and deployment services. The main driver is to reduce cost for network deployment and operation.

- **Service and infrastructure cooperation through a joint venture**

For the specific service of interest, in this paper mobile payments, the joint venture represents and acts on behalf of the mobile operators that also owns the joint venture. The mobile payment services are provided by the joint venture using its own brand, and the operators do not provide any of these services. The main driver is to offer a payment solution common for all operators in order to complement or compete with solutions provided by other industries.

It would be interesting to look into the dynamics of mobile operator inter-industry cooperation and how it can or may evolve into inter-industry competition or co-opetition. An example is mobile operators that cooperate with handset manufacturers (Apple, Samsung, Nokia) and Internet companies (Facebook, Spotify) in order to offer a competitive service bundle to consumers. However, both handset manufacturers and Internet companies have already started to compete with the mobile operators by providing mobile services and by establishing direct relations with end-users.

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