

# Value Creation in the Mobile Market

## A Reference Model for the Role(s) of the Future Mobile Network Operator

This paper examines the reconfiguration of value chains and strategies in the mobile market. It develops a reference model for the mobile market value net, including today's and tomorrow's relevant value creation activities and the according value flows. The activities form roles which can be attributed to actors in all conceivable combinations, with regard to existing as well as new market players. The research is based on a worldwide survey of the top-30 mobile network operators' service portfolio, on the analysis of additional market players and influencing factors and on the evaluation by practice experts. In an additional step, a criteria catalogue for planning future scenarios is provided and used with the reference model for the development of a scenario based on innovative elements from international case studies.

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### 1 Introduction

Telecommunication and mobile markets in particular are characterized by increasing competition dynamics. These dynamics result from liberalization, convergence, and technical standards (Jakopin 2006, p. 38; Picot 2006, p. 16). Furthermore, companies that traditionally come from other areas of the value chain compete with mobile network operators (MNO) for the central customer ownership. At the same time, the focus has shifted from simple network access to value-added services and from MNO to originally non-telecommunication companies (Doebelin and Dowling 2007, p. 31), such as classic hardware manufacturers or IT companies. As a major example, Apple entered the market in 2007 and nowadays offers in a closed approach ("walled-garden") a mobile device with a proprietary operating system (OS) and the according mobile portal and services. Another example is Google. The company entered the market with the launch of the Android OS in 2008. Moreover, even media, trade, and finance companies offer mobile services to their customers (e.g., Virgin Mobile by Virgin Enterprise Ltd., 7-Eleven SpeaksOut by 7-Eleven Canada Inc., PosteMobile by Poste Mobile S.p.a., a subsidiary of the Italian Post Bank).

The increasing demand for data services creates an increasing demand for

network capacity and bandwidth. To satisfy this demand, continuous investments in new, increasingly powerful infrastructures are necessary. Capital (CAPEX) and operational expenditure (OPEX) for the mobile network are borne by MNO. These rising costs face falling retail prices and thus constitute a strategic problem for MNO (e.g., VATM 2010). However, the beneficiaries of the improved network infrastructure are mostly service providers such as Apple, Google or Facebook.

As in other industries, the increasing maturity of the mobile industry has basically changed the traditional vertically integrated value chain to a value network. This change replaces the clear and straightforward relationship of few players with a complex system of roles which can be executed by changing actors in changing combinations. The exact future configuration of this value network is as unknown as the optimal strategic IT support for according combinations.

The aim of this paper is to develop a reference model at the role level which describes the system of existing and future roles in mobile markets and explains them with regard to the value exchange relationships between these. The model is based on case study research and value flow analysis. It is suitable both as a tool for researchers to allow for structured analysis and comparison as well as for practitioners to support the design of fu-

ture business models and strategy development.

The paper is organized as follows: Section 2 provides a literature review and describes the methodology. Section 3.1 analyzes actors and activities. Section 3.2 identifies and describes the respective roles and analyzes their current and future value activities. Section 3.3 combines roles and value flows to the reference model. Section 4 shows the exemplary application and evaluation giving practical examples. The paper concludes with a discussion of implications for research and practice and provides an outlook.

## 2 Background

### 2.1 Literature Review

Numerous papers provide research in mobile markets. However, previous papers consider mainly individual business models (e.g., Maitland et al. 2002; Olla and Patel 2002; TalebiFard et al. 2010). Few papers examine value networks and MNO revenue models (e.g., Gerum et al. 2003; Winkelmann 2008). Anderson and Williams (2004) analyze the mobile value chain and observe increasing fragmentation. Pousttchi and Hufenbach (2009) analyze and categorize MVNO business models. Banerjee and Dippon (2009) investigate the sources of voluntary collaboration between MNO and MVNO. Hew and White (2008) develop models for resource negotiation in shared networks. Ulset (2002) examines transaction costs in telecommunication markets. In one of the few scientific contributions to network sharing, Bartlett and Jackson (2002) analyze the costs of different scenarios.

The change in the mobile value chain and its relevant market players are mostly discussed by practitioners (e.g., Chanab et al. 2007; Weiss 2006; Zoll and Terfloth 2007).

In terms of methodology, papers predominantly stay on an argumentative-deductive level and the analysis of value creation rarely goes beyond the presentation of a Porter value chain. Scientific modeling methods are rarely used.

### 2.2 Methodology

Considering the aforementioned problem, the identification of activities, roles, and value flows requires an exploratory, qualitative-empirical approach. For the purposes of this paper, case study analysis

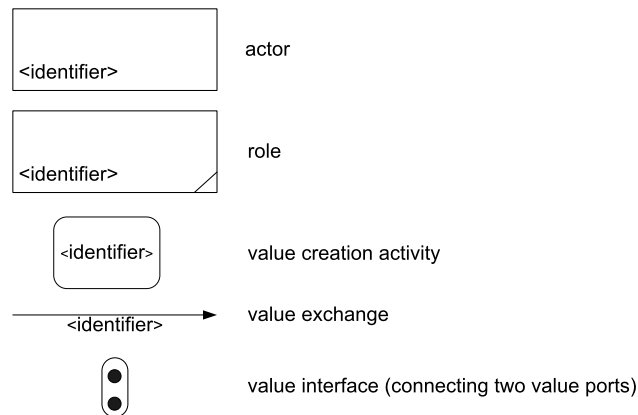


Fig. 1 Modeling primitives

is best suited as it enables a holistic detection and analysis of activities (Eisenhardt 1989; Yin 1981, 2009). In recent years, acceptance of case study research in BISE is constantly increasing (Riedl and Roithmayr 2007, p. 56).

Based on this, a reference model for the value network is to be developed. Particularly suitable for this aim is the value-flow analysis. It is based on cost flow analysis and considers value creation, earnings, and returns of a process (Besanko et al. 2010, p. 406). The focus of this methodology is on the definition, derivation, and analysis of the relationships in inter-organizational systems (Nalebuff and Brandenburger 1996). The used modeling method in this paper is based on the E<sup>3</sup>-value model, a conceptual method for the description of business models (Gordijn et al. 2000, p. 11). Because of the problem described in Sect. 1, this method is to be extended by a role concept; for this purpose we follow Pousttchi (2008, p. 184). In this approach, activities are assigned to roles and roles are assigned to actors. Initially, a generic model is created at the role level. In a second step, actors are introduced in order to analyze various concrete market constellations. The necessary modeling primitives are shown in Fig. 1.

In order to develop future scenarios, we finally combine the previously described methods with scenario planning, visualizing the possible future developments based on various market factors and uncertain environmental influences (Godet 2000; Roubelat 2000; Shoemaker 1995). The determinants of scenario planning are additionally evaluated by expert interviews.

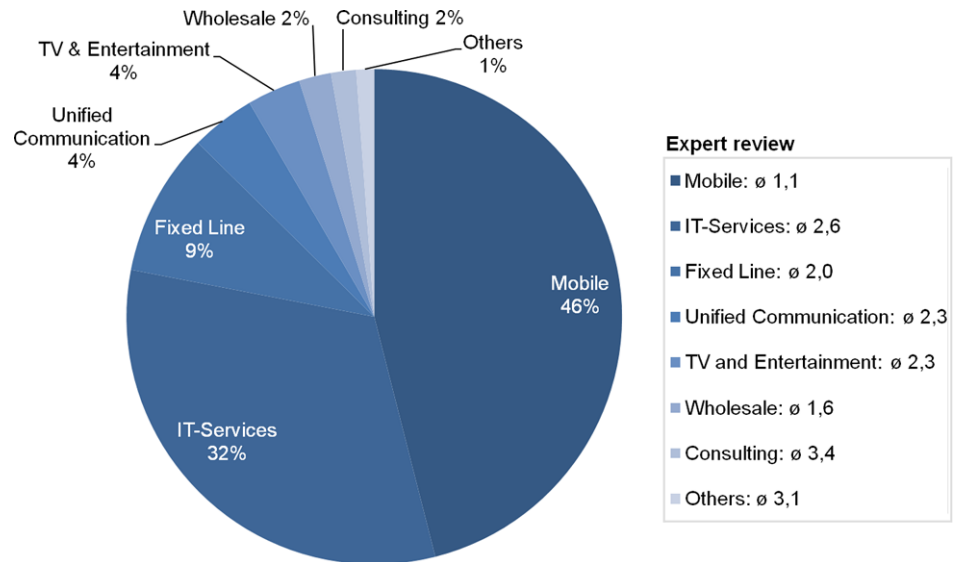
## 3 Current and Future Value Activities

Starting from a market analysis, the following section identifies value activities and roles, analyzes the value flows between them, and combines these to the reference model.

### 3.1 Analysis of Existing Actors and Activities

Although many practitioners and researchers have studied the activities of mobile market participants, there is hardly any publicly available data which allow for analysis. Therefore, in the course of this research a survey of the activities of the world's largest 30 MNOs (by number of customers, including subsidiaries) has been carried out. In addition, the activities of Google, Apple, and the MVNOs on the European market have been analyzed. The survey uses an exploratory approach. Publicly available data, such as company news, business reports or press releases, were systematically compiled. The analysis does not claim to be exhaustive as not all data are publicly available.

A total of 428 B2C and B2B services were identified. These services were categorized by means of the classification method (Schnell et al. 2008, pp. 463–464). This method uses an iterative process to summarize similar services to superordinate groups until an optimal level is reached. Within this process, eight categories were identified. *Mobile services* is the largest category with 197 services, including network access, voice and data services. The category *IT services* includes 137 services, especially web and hosting applications. The category *fixed network services* includes 40 services, like

**Fig. 2** MNO-services

telemarketing or -voting. The category *unified communications* contains 18 services, such as fixed-mobile convergence. The category *TV and entertainment* consist of 15 services, including cable TV and video streaming. The category *wholesale* contains nine services, the category *consulting* seven and the category *other* five services, such as insurance or the offer of credit cards. The relative importance of the categories and the relative number of MNO services are shown in **Fig. 2**.

The categorization and the relevance of each category for future MNO business models were evaluated by expert interviews. For this purpose, seven experts from four German and three other European MNOs were interviewed. A 5-point Likert scale (1 = high importance, 5 = low importance) was used and the arithmetic mean of expert ratings was calculated (**Fig. 2**). The expert interviews did not reveal missing categories.

In addition to the MNO, 13 European mobile markets and the activities of their MNO and MVNO were examined. As for the number of MVNOs, Germany is the largest market with more than 150 MVNO brands. These MVNOs are characterized by various types of business models, differing in particular regarding vertical integration depth and regarding customer ownership (Pousttchi and Hufenbach 2009, pp. 90–91).

In addition, the activities of Apple and Google – as the two market players most significant in terms of market power – were included. Besides mobile devices with the corresponding OS, they offer mobile platforms, services, content, and portals. Moreover, both companies are

extending their mobile marketing activities (Handelsblatt 2010) and beginning to develop NFC-enabled devices and related services. Furthermore, Google already offers a payment procedure with Google Checkout, and both companies are working on the development of mobile payment procedures.

Based on the analysis of the mentioned services, the roles and activities for the reference model are developed in the following.

### 3.2 Activities and Roles Within the Value Network

A characteristic of mature industries, such as automotive, airline or finance industry, are increased competition, specialization and division of labor. Market players concentrate more on their core business activities and outsource other value activities (Moerman et al. 2009, p. 375). As a result, a development from a vertically integrated towards a fragmented value chain (Peppard and Rylander 2006, pp. 131–132) and finally to a value network can be observed.

Turowski and Pousttchi (2004, p. 130) present the current mobile value chain in different aggregations. For a categorization of actors, the reduced representation with three value creation areas is especially suited (**Fig. 3**).

Based on this coarse-grained categorization, one effect becomes especially

visible: From both ends of the chain, market players use their core business customer base in order to advance to the middle of the value chain. Their aim is the takeover of the central customer ownership which is currently still tied to network operation.

In the following, we identify and describe roles, i.e. typical combinations of value activities which can – later on – be assigned to one (possibly changing) actor. For developing the roles we used Turowski and Pousttchi (2004) as well as Winkelmann (2008) as start solutions. (The more complex roles are additionally presented in **Figs. 4–11**).

*Device manufacturers* deliver mobile devices for B2B and B2C customers. An impressive example for the difference between the actor and the role “device manufacturer” is Apple. An indicator for the strong competition of MNOs, device manufacturers and other actors for customer ownership is the discussion about the location of the secure element for NFC data (SIM/UICC vs. mobile device vs. removable storage media).

*Infrastructure suppliers* provide the required hardware and software for the technical operation of the Radio Access Network (RAN), such as base stations, antennas and their system software. Earnings arise from the supply and maintenance of technical components.

*RAN operators* (**Fig. 4**) provide the technical operation of the RAN and exe-

**Fig. 3** Value creation areas (Turowski and Pousttchi 2004, p. 130)

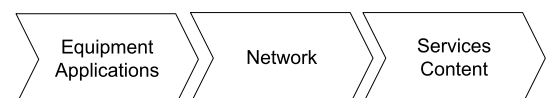


Fig. 4 RAN Operator

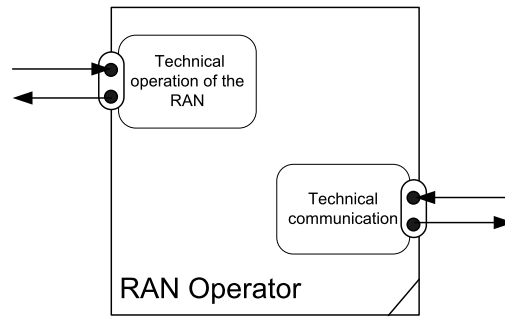


Fig. 5 Licensee

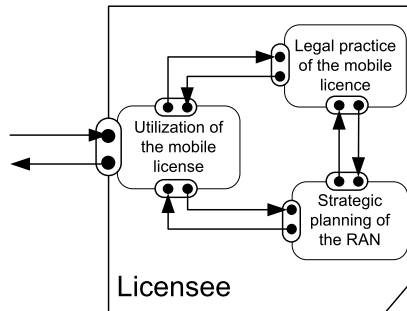


Fig. 6 CN operator

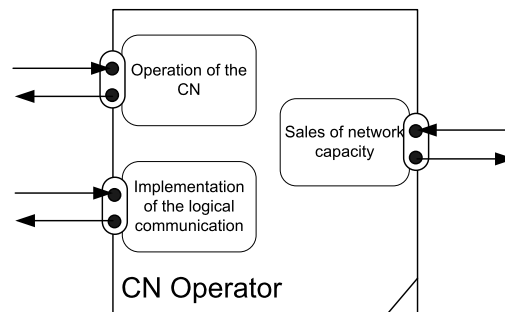
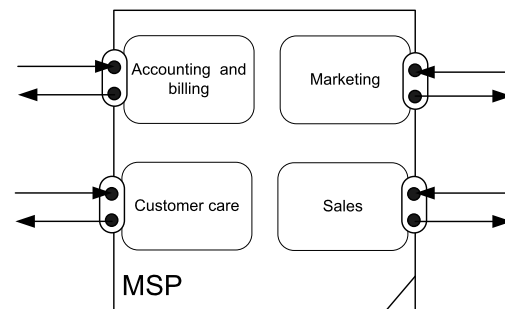


Fig. 7 MSP



ecute the technical communication on the air interface. This service is currently provided for single MNO, but prospecting can be provided to multiple ones at the same time.

*Licensees* (Fig. 5) acquire the mobile network license and execute it in the legal context (Mellewigt 2003, p. 173). This includes strategic RAN planning (Weiss 2006, p. 44). The return on investment on CAPEX is achieved by the exploitation of the mobile license.

*Core network operators* (Fig. 6) operate the core network (CN) and run the logical communication on the air interface. In addition to the RAN operator, they bear the substantial CAPEX and OPEX of the technical realization.

*Mobile service providers (MSP)* (Fig. 7) launch mobile services in their own name and market them on their own account. Additionally, they provide customer service, accounting, and billing. Due to the high degree of outsourcing and the low infrastructure investment, the CAPEX

and the capital risk in relation to the OPEX are low (Smura et al. 2008, p. 35).

*Portal operators* (Fig. 8) provide specifically targeted and personalized mobile applications and content for customers (Winkelmann 2008, pp. 12–13). They select, bundle and market contents and applications (Turowski and Pousttchi 2004, p. 133). Bundling is typical, but not mandatory; the role is defined by distribution of mobile services and applications to customers via the mobile channel.

*Application developers* create customized client and server applications for mobile devices and for the provision of services for these devices.

*Content providers* create content such as news and audio, video or graphics files.

*Mobile payment service providers (MP SP)* provide mobile payment procedures. *Mobile payment* is a type of payment transaction processing in which the payer uses mobile communication techniques in conjunction with mobile devices for initiation, authorization, or completion of payment (Pousttchi 2008, p. 183). Within mobile commerce (MC), MP SP release the provider of content or services from payment processing and thus enable a variety of business models in this area. Outside MC, the MP SP itself is a provider of a mobile service for the processing of payments, e.g., at a retail point-of-sale.

*Trusted service managers (TSM)* distribute and manage applications and keys on the UICC (*Universal Integrated Circuit Card*), in protected memory areas of mobile devices or other storage media. At the runtime of a service they authenticate the transaction partners and guarantee end-to-end security.

*Mobile marketing service providers (MM SP)* (Fig. 9) provide advertisers with the infrastructure, the expertise and a customer database for marketing campaigns run on mobiles. In the simplest case, this involves *mobile advertising* (banner ads on the mobile Internet or in mobile applications). In the future, mobile marketing will focus more on active campaigns and involvement of users (Pousttchi and Wiedemann 2009, pp. 1–9).

*Mobile ticketing service providers (MT SP)* (Fig. 10) provide procedures for electronic ticketing using mobile technologies and devices, e.g. for events or for public transport. Furthermore, they handle ticket bookings and validations.

Fig. 8 Portal operators

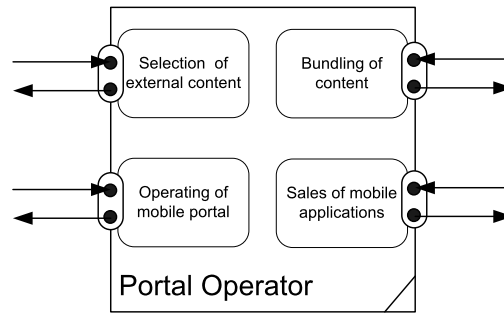


Fig. 9 MM SP

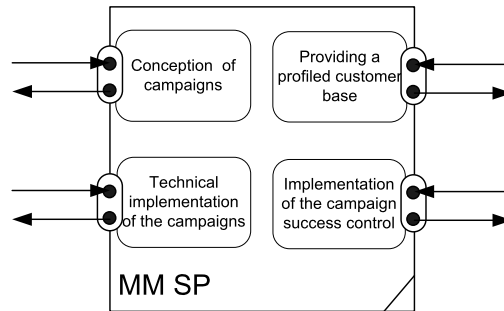


Fig. 10 MT SP

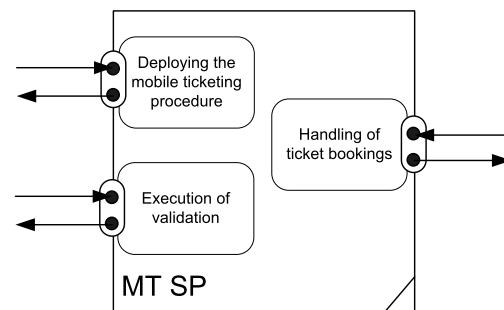
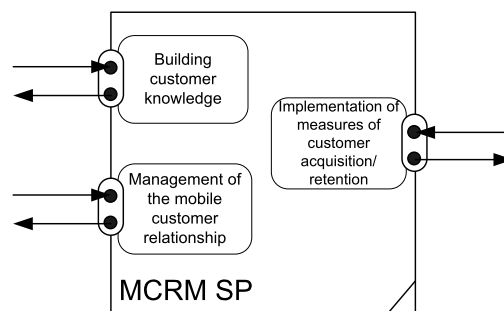


Fig. 11 MCRM SP



*Mobile-integrated business processes service providers (MIBP SP)* provide business customers with technical and process know-how to manage the construction and the technical infrastructure of mobile-integrated business processes (Habermann and Pousttchi 2009, p. 1; Pousttchi and Thurnher 2006, p. 110).

*Mobile customer relationship management service providers (MCRM SP)* (Fig. 11) provide business customers, e.g. from retail/service/banking, with techni-

cal and process know-how to manage the mobile customer relationship. In addition, they provide the technical and other infrastructure for the operation (Payne and Frow 2006, p. 143; Srivastava et al. 1999, p. 169).

### 3.3 Reference Model

In this section, the 15 previously identified roles are combined to form the reference model. For this purpose, the ex-

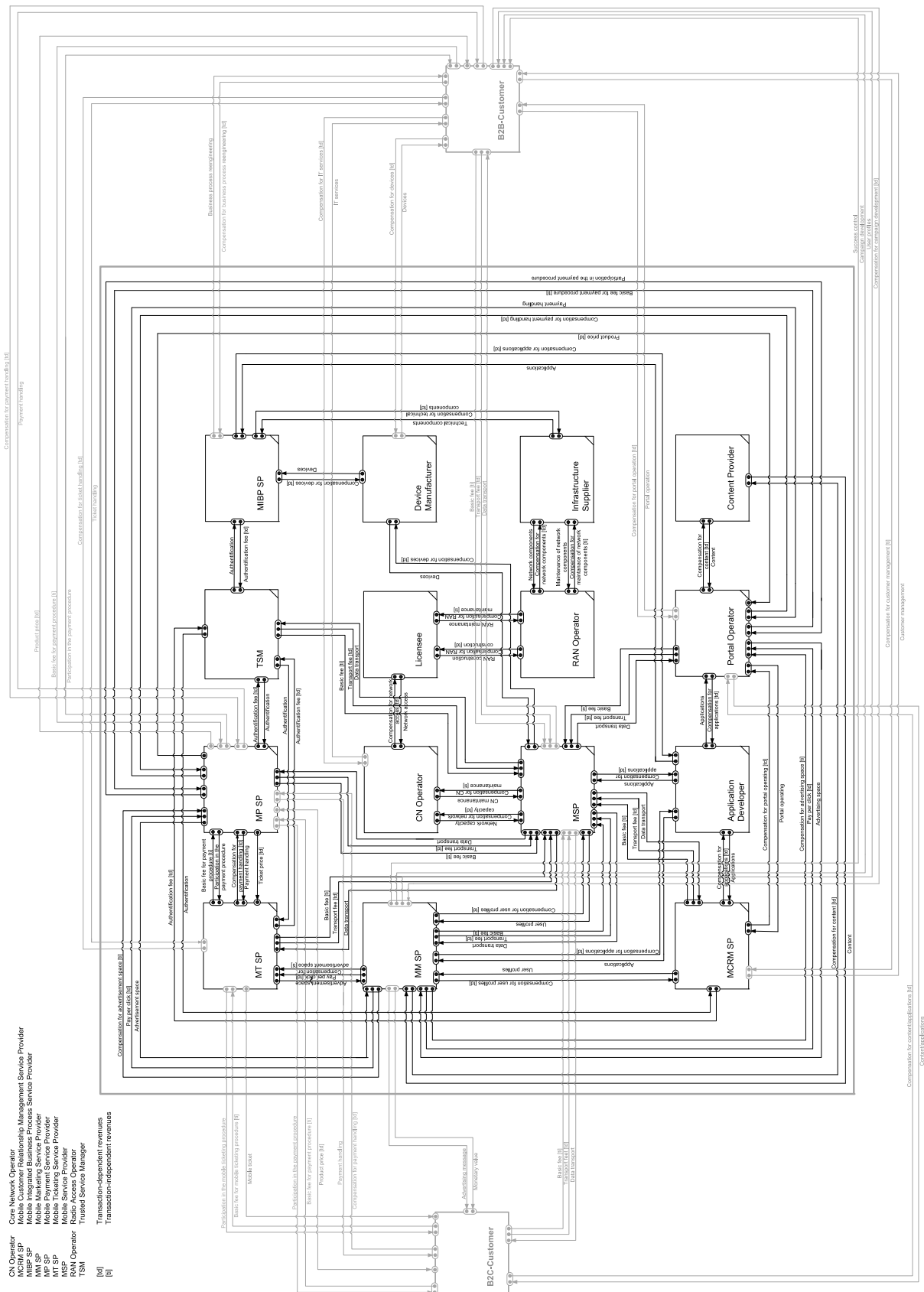
changed value objects are specified, derived from the activities described in Sect. 3.2. To make the model analytically complete, two necessary actors have to be added: B2B and B2C customers. The complete reference model is shown in Fig. 12.

An assignment of the roles in the (gray-framed) core area to actors is not part of the basic model but takes place when using the model for analysis or design. This will be shown in Sect. 4.2 with the construction of a future scenario. First, however, we have to provide the necessary factors for the problem and environment analysis which are required for the planning of such a scenario.

## 4 Development of Future Scenarios

In principle, MNOs can fulfill all roles and value-added activities in the reference model with the exception of the infrastructure supplier and the device manufacturer. However, the market currently shows a trisection: (1a) The roles *licensee*, *RAN operator*, *CN operator*, and *MSP* constitute the core of the “classical” MNO with a direct consumer relationship of its own. (1b) Typical additional roles are *portal operator* and *application developer*. These roles are performed by most MNOs. (2) Furthermore, there are roles that are close to the core business and can be understood as an extension of the infrastructure offer but require substantial additional expertise. These roles are already performed by a number of MNOs. (3) Only occasionally, new roles are taken on in order to enable new business models and revenue sources. A couple of remunerative roles could arise from exploiting and purposefully expanding MNO core competencies and key assets, however, these would require a high level of new know-how.

The issue of future MNO roles depends on both external market influences as well as intra-corporate factors. The scenario in Sect. 4.2 shows the future MNO in two variants which represent, respectively, an upper and lower limit. The difference is represented by the assignment of roles of group (2) and (3). However, following classical scenario planning, we have to begin with problem analysis and environment analysis in order to develop a set of criteria.



- Core Network Operator
- Mobile Customer Relationship Management Service Provider
- Mobile Integrated Business Process Service Provider
- Mobile Payment Service Provider
- Mobile Ticketing Service Provider
- Mobile Service Provider
- Mobile Service Manager
- Transaction-independent revenues
- Transaction-dependent revenues

**Fig. 12** Reference model for the value creation in the mobile market

**Table 1** Decision fields and influence factors

Decision fields	Influence factors	Sources
Politics and regulation (evaluation: $\emptyset$ 1,4)	<ul style="list-style-type: none"> <li>■ Regulation regarding network sharing</li> <li>■ Antitrust regulation of horizontal cooperations</li> <li>■ Promotion of competition for services and infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>■ European Union 2002; Maitland et al. 2002, p. 497; Chaudhury and Terfloth 2007, pp. 7–8</li> <li>■ Chanab et al. 2007, p. 2; European Union 2001; Kruse 1993, p. 8</li> <li>■ Jaspers et al. 2007, p. 209; Schmidt and Rommel 2002, p. 225; Winkler 2006, p. 96</li> </ul>
Competition (evaluation: $\emptyset$ 2,1)	<ul style="list-style-type: none"> <li>■ Selection of strategic partners (network sharing and outsourcing)</li> <li>■ Intensity of competitive rivalry and potential entrants</li> <li>■ Market power of suppliers</li> <li>■ End-customer demand behavior for services</li> <li>■ Substitutes</li> <li>■ Mobile phone penetration</li> <li>■ Prices for data and voice services</li> </ul>	<ul style="list-style-type: none"> <li>■ Banerjee and Dippon 2009, p. 75; Frisanco et al. 2008, p. 129; Hew and White 2008, p. 4173</li> <li>■ Anderson and Williams 2004, p. 53; Gerpott 2001, p. 47; Urban 2003, p. 3</li> <li>■ Gerum et al. 2003, pp. 82–83; Moerman et al. 2009, p. 375</li> <li>■ Gerum et al. 2003, pp. 161–162; Vogelsang 2002, p. 2</li> <li>■ Gerum et al. 2003, pp. 163–165; Porter 1992, p. 26</li> <li>■ ITU 2010, p. 1</li> <li>■ BNetzA 2011, p. 68</li> </ul>
Innovation/IT (evaluation: $\emptyset$ 1,4)	<ul style="list-style-type: none"> <li>■ Development of technical standards (e.g., NFC)</li> <li>■ Costs for innovations, network infrastructures, and network equipment</li> <li>■ Development of convergence services (e.g., FMC)</li> <li>■ Type and price of mobile devices</li> </ul>	<ul style="list-style-type: none"> <li>■ Hill and Rothaermel 2003, p. 260; Maitland et al. 2002, pp. 498–499</li> <li>■ Frisanco et al. 2008, p. 135; Peppard and Rylander 2006, p. 129</li> <li>■ Doebelin and Dowling 2007, p. 35; Wieland 2007, pp. 46–47; Winkelmann 2008, pp. 99–128</li> <li>■ Peppard and Rylander 2006, p. 129</li> </ul>
Management (evaluation: $\emptyset$ 1,7)	<ul style="list-style-type: none"> <li>■ Outsourcing and specialization degree of actors</li> <li>■ Application of own resources and skills by actors</li> <li>■ Strategy of actors</li> <li>■ Market power and image of actors</li> <li>■ Customer ownership</li> <li>■ Governance</li> </ul>	<ul style="list-style-type: none"> <li>■ BITKOM 2009, p. 7; Picot 2006, p. 14</li> <li>■ Gerpott 2001, p. 54; Porter 2001, p. 71; Ulset 2002, p. 542; Winkler 2006, p. 96</li> <li>■ Gerum et al. 2003, pp. 239–241; Porter 2001, pp. 61–63; Sabat 2008, p. 252; Schmitz 2008, p. 2; Weiss 2006, p. 64</li> <li>■ Porter 2001, p. 78; Schmitz 2008, pp. 2–3; Winkler 2006, p. 96; Xavier 2001, p. 40</li> <li>■ Anderson and Williams 2004, p. 53; Doebelin and Dowling 2007, p. 36</li> <li>■ Vogelsang 2002, p. 2</li> </ul>

#### 4.1 Problem Analysis and Environment Analysis

The problem and the environment analysis involve the identification of the main decision fields with their related influence factors, important trends, and key uncertainties.

Initially, decision fields have to be identified in a two-stage process (Shoemaker 1995, p. 28). The first step is a systematic literature review of the mobile market development of the past 10 years. On that basis, we identified four decision fields and their influence factors which particularly shape the mobile communications industry and future MNO business models: *politics and regulation*, *competition*, *innovation and IT*, *management* (Kaplan and Norton 2008, p. 47; Maitland et al. 2002, p. 495; Park and Rye 2005, p. 139;

Shoemaker 1995, p. 28). In the second step, results and the relevance of the individual fields were evaluated by experts, similarly to Sect. 3.1. Results and evaluation are shown in **Table 1**.

For further exploration of the ecosystem (Gausemeier et al. 1995), predictable factors of the development directions were in the following identified as *trends* (Shoemaker 1995, p. 28). For a total of 13 authoritative past and current developments, evidence can be furnished by market observations or contributions from science or practice (**Table 2**).

From the perspective of the interviewed experts, the importance of four elements has to be emphasized: data traffic (T11), strategic partnerships (T8), convergence services (T10) and price decline for telecommunication services (T12).

Finally, the unpredictable factors of development were identified as *uncertainties* (Shoemaker 1995, p. 28). A total of 13 future developments were identified in analogy to our previous procedure (**Table 3**).

From the perspective of the experts, particularly regulation (U1), differentiation potential (U8), and responsiveness (U12) have to be highlighted.

For the development of future scenarios we use a morphological box (Godet 2000, p. 14; Zwicky 1966, pp. 88 ff.). It allows the analysis of complex problems that cannot be solved by formal methods, causal modeling or simulation (Ritchey 2011, p. 3). Structured development and presentation as well as systematic comparison of scenarios are enabled.

The development takes place in a three-stage process of negation and construc-

**Table 2** Important trends

Decision fields	Important trends	Sources
Politics and regulation	<ul style="list-style-type: none"> <li>■ Increasing service competition and decreasing infrastructure competition (T1)</li> <li>■ Regulation of market access (T2)</li> <li>■ Regulation of MNO as market-dominating players (T3)</li> </ul>	<ul style="list-style-type: none"> <li>■ Jaspers et al. 2007, p. 209; Schmidt and Rommel 2002, p. 225; Winkler 2006, p. 96</li> <li>■ Jaspers et al. 2007, pp. 206–207; Varoutas et al. 2006, p. 132; Shin 2008, p. 163</li> <li>■ Smura et al. 2008, p. 29</li> </ul>
Competition	<ul style="list-style-type: none"> <li>■ Increasing competitive rivalry by market entrance of non-telecommunication players(T4)</li> <li>■ Increasing market saturation (T5)</li> <li>■ Increasing customer market power (T6)</li> <li>■ Increasing fragmentation of the value chain by increased division of labor (T7)</li> <li>■ Increasing number of strategic partnerships (T8)</li> </ul>	<ul style="list-style-type: none"> <li>■ Doebelin and Dowling 2007, p. 31; Hufenbach 2011, p. 2; Picot 2006, p. 30</li> <li>■ BMWi 2009, p. 133; VATM 2010</li> <li>■ Moerman et al. 2009, p. 375; Portio Research 2011, p. 6</li> <li>■ Anderson and Williams 2004, p. 52; Peppard and Rylander 2006, pp. 131–132; Schmitz 2008, pp. 2–3</li> <li>■ BMWi 2009, p. 153; Dheghan and Cooper 2008, p. 4</li> </ul>
Innovation/IT	<ul style="list-style-type: none"> <li>■ More powerful networks and devices (T9)</li> <li>■ Convergence services (T10)</li> <li>■ Increased data traffic (T11)</li> </ul>	<ul style="list-style-type: none"> <li>■ BMWi 2009, pp. 142–144; Portio Research 2011, pp. 19–24</li> <li>■ Doebelin and Dowling 2007, p. 35; Picot 2006, p. 35; TNS Infratest 2008, pp. 2–3; Wieland 2007, pp. 46–47</li> <li>■ BMWi 2009, p. 145; Portio Research 2011, p. 11</li> </ul>
Management	<ul style="list-style-type: none"> <li>■ Challenge by price decline for telco services (T12)</li> <li>■ Increasing degree of outsourcing (T13)</li> </ul>	<ul style="list-style-type: none"> <li>■ BMWi 2009, p. 122; Seckler 2005, p. 24</li> <li>■ Anderson and Williams 2004, p. 53; Frisanco et al. 2008, p. 129; Moerman et al. 2009, p. 375; Schmitz 2008, p. 2</li> </ul>

**Table 3** Key uncertainties

Decision fields	Key uncertainties	Sources
Politics and regulation	<ul style="list-style-type: none"> <li>■ Unforeseen development in the antitrust regulation of horizontal cooperation (U1)</li> </ul>	<ul style="list-style-type: none"> <li>■ Chanab et al. 2007, p. 2; Vogelsang 2002, p. 2; Pelkmans 2001, p. 436; Sabat 2004, p. 14</li> </ul>
Competition	<ul style="list-style-type: none"> <li>■ Market dominance of actors (U2)</li> <li>■ Entry and market power of substitution providers (U3)</li> <li>■ Selection of partners (U4)</li> <li>■ Success of activities and services (U5)</li> </ul>	<ul style="list-style-type: none"> <li>■ BITKOM 2009, p. 5; Picot 2006, p. 30</li> <li>■ Freyberg 2007, p. 143; Sabat 2004, p. 13; Winkelmann 2008, p. 90</li> <li>■ Berret 2009, p. 348; Hultell et al. 2004, p. 3394; Picot 2006, p. 34</li> <li>■ BITKOM 2009, p. 6; BMWi 2009, p. 145; Maitland et al. 2002, p. 495</li> </ul>
Innovation/IT	<ul style="list-style-type: none"> <li>■ Technical standards (U6)</li> <li>■ Costs of future network infrastructures and innovations (U7)</li> </ul>	<ul style="list-style-type: none"> <li>■ Friedrich et al. 2001, p. 9; Hultell et al. 2004, p. 3394; Maitland et al. 2002, pp. 498–499</li> <li>■ BNetzA 2011, p. 70; Hew and White 2008, p. 4173; Frisanco et al. 2008, p. 129</li> </ul>
Management	<ul style="list-style-type: none"> <li>■ Differentiation potential (U8)</li> <li>■ Customer Ownership (U9)</li> <li>■ Degree of specialization and outsourcing (U10)</li> <li>■ Achievement of composite effects (U11)</li> <li>■ Responsiveness to market changes (U12)</li> <li>■ Degree of dependency of partners (U13)</li> </ul>	<ul style="list-style-type: none"> <li>■ Friedrich et al. 2001, p. 9; Gerpott 2001, p. 47; Sabat 2004, p. 10; Winkler 2006, p. 68</li> <li>■ BNetzA 2011, p. 86; Friedrich et al. 2001, p. 9; Sabat 2004, p. 13</li> <li>■ BITKOM 2009, p. 7; Frisanco et al. 2008, p. 132</li> <li>■ Freyberg 2007, pp. 144–147; Dheghan and Cooper 2008; Hew and White 2008, p. 4174</li> <li>■ Hill and Rothaermel 2003, p. 259; Sabat 2004, p. 7; Ulset 2002, p. 543</li> <li>■ Hultell et al. 2004, p. 3394; Urban 2003, p. 4; Zoll and Terfloth 2007</li> </ul>



Criteria	Characteristics					
<b>Competition policy and regulation (U1)</b>	Self-governed negotiation based on market rules		Mandatory rules for network capacity		Restrains of competition due to regulation (prices, products, network access) and prohibition of horizontal cooperations of market dominating companies	
<b>Market dominance (U2)</b>	MNO	IT and hardware provider		Service provider		None
<b>Competitors (U3)</b>	MNO	IT and hardware provider		Service provider		None
<b>Cooperation partner (U4)</b>	MNO	IT and hardware provider		Service provider		None
<b>Competition advantages (U5)</b>	Process-oriented cost advantages		Customer-oriented advantages (fast reaction on changing customer demands)		Technology-oriented advantages (mature products and communication processes)	
<b>Business model relevant innovations (U6)</b>	Network outsourcing	Cloud computing	Convergence	Spontaneous networking	Ongoing standardization	Further
<b>Impact on cost structure (U7)</b>	Cost for network infrastructure (CAPEX/OPEX)	Costs for outsourcing and monitoring		Costs for content acquisition	Costs for marketing and sales	Transaction costs
<b>Differentiation potential (U8)</b>	Services / products		Customers		Brand	
<b>Customer ownership (U9)</b>	MNO	IT and hardware provider		Service provider		Several players
<b>Degree of specialization (U10)</b>	Full coverage of the mobile value chain (low specialization level)		Coverage of several parts of the mobile value chain (average specialization level)		Concentration on core competencies (high specialization level)	
<b>Economies of scope (U11)</b>	Horizontal bundling of product segments (horizontal diversification of the range of services)		Vertical linkage of value creation levels (vertical diversification of the range of services)		None	
<b>Flexibility (U12)</b>	High (fast response on market changes)			Low (low response on market changes)		
<b>Degree of dependence (U13)</b>	High		Average		Low	

**Fig. 13** Morphological box

tion (Schnell et al. 2008). Uncertainties constitute the criteria in the rows of the morphological box. For the most important criteria, instances are identified which form the columns of the respective row (Ritchey 2011, p. 3). For the development of scenarios a reconstruction is performed, resulting in the selection of one (or more) characteristic(s) for each criterion, and a combination of the different characteristics forms the scenario.

The morphological box, too, was evaluated in the course of the expert interviews (following the same process as above). The discussion led to refinements of the model. For reasons of space, the morphological box in Fig. 13 is already shown with the markings for the following scenario.

The presented tables and tools allow for derivation of both extreme and trend scenarios, as well as for comparison of as-is and target state. In the following, a future scenario is presented in two variants in the reference model. In doing so, we combine evaluation and exemplary application of the model.

#### 4.2 Scenario Mobile Network Enabler

The future scenario is already defined by the markings in Fig. 13. It is character-

ized by a combination of network sharing and network outsourcing, representing a response to rising costs and regulatory pressure, and by the creation of a new actor, the *Mobile Network Enabler (MNE)* which fulfills the role of the RAN operator.

*Network sharing* ranges from the joint use of sites and base stations (cases such as Indus Towers, Vodafone Essar, Bharti Infratel, and Idea Cellular), transmission and other CN elements (cases such as Vodafone and Orange in the UK) to frequency pooling (European Union 2002; Frisanco et al. 2008, p. 132). Network sharing leads to a cost reduction potential of an average of 30% (Ohler 2010), while a reduction of OPEX by up to 33% and CAPEX by up to 36% can be achieved (Chaudhury and Terflöth 2007, p. 3). In return, however, costs for monitoring and service level agreements incur (Schmitz 2008, p. 4).

*Network outsourcing* (cases such as Bharti Airtel to Ericsson in India, Orange to Ericsson in the Netherlands) is characterized by MNOs remaining in control over quality parameters and network planning (Zoll and Terflöth 2007). First developments towards a combination of network sharing and network outsourcing are recognizable (cases such as Yota in Russia, MBNL and Cornerstone in UK).

Thus, the MNO is losing one of the roles of group (1a), and a separation between network access and services occurs. The specific parameters of the scenario can be inferred from the shaded instances in Fig. 13.

This scenario requires a further development of regulation which still requires the coupling of RAN and license. Such an evolution is not unlikely, especially as the European Commission has been endorsing the use of common infrastructure for some time (European Union 2001). In this case the role *licensee* remains with the player MNO. If the MNE was previously an infrastructure supplier, he still will fulfill that role and a typical combination arises which remains stable throughout the scenario whereas the roles of groups (2) and (3) can be performed by different actors.

If the MNO integrates these roles, the variant *Strong MNO* occurs (actors shown in Fig. 14 with solid lines). Here, the MNO is able to maintain the central customer ownership against the threat of new entrants such as Apple, Google and Facebook. CAPEX and OPEX saved by the MNE are invested in mobile services and the roles of group (2) are performed: MT SP, MP SP, TSM. Examples of MNO in the role of MT SP are A1 in Austria

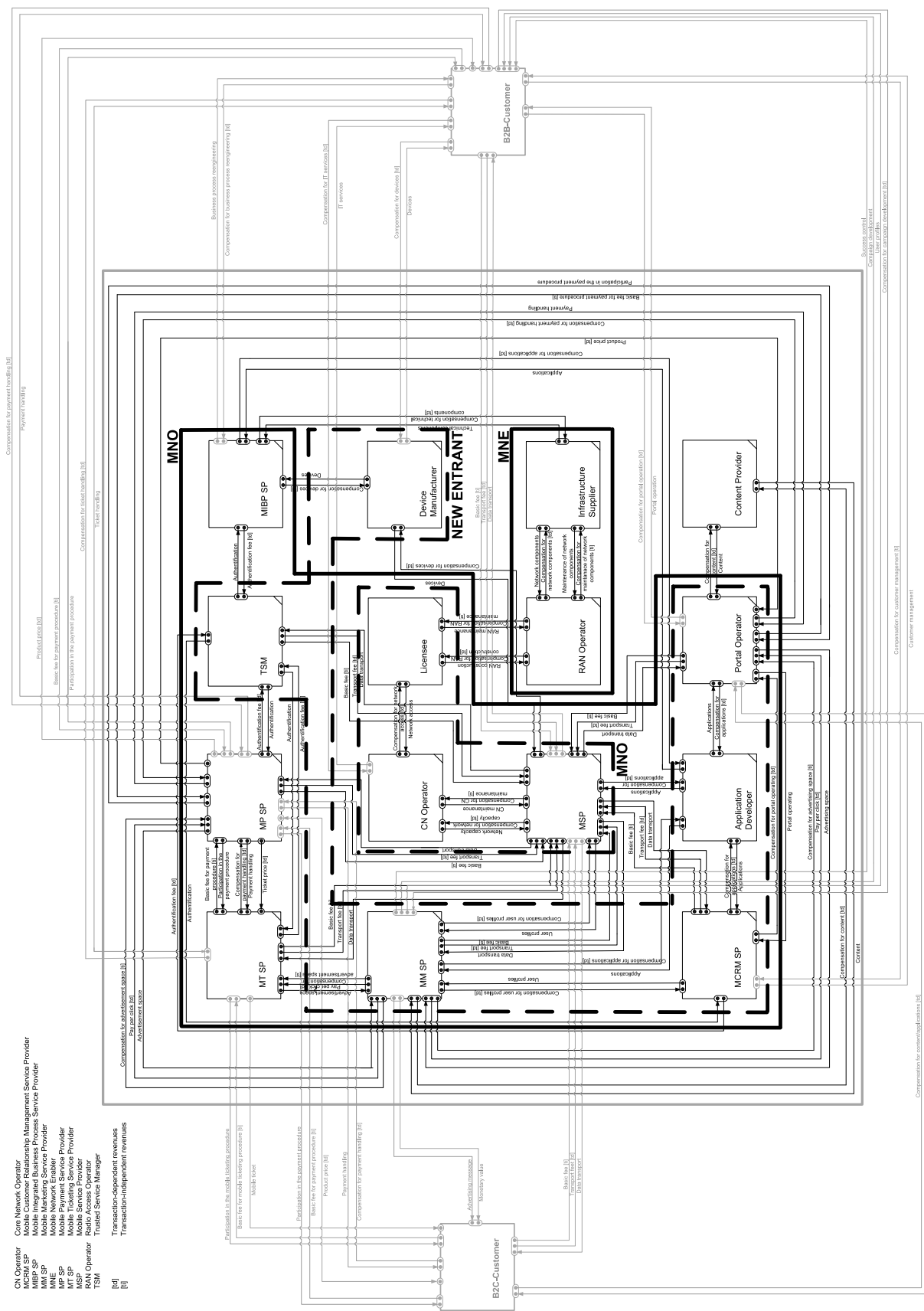


Fig. 14 MNE

for road toll, EMT (TeliaSonera) in Estonia for M-Parking and the “CityZi” alliance of Bouygues/Orange/SFR in France for public transport. The role of MP SP is fulfilled, for instance, by China Mobile, NTT Docomo, or the “mpass” alliance of Vodafone/Telefonica O2/Deutsche Telekom. The TSM role would logically fit into this series. Furthermore, the MNO can take over the roles of group (3): MM SP, MCRM SP, MIBP SP. The potential of the MM SP role is generally recognized, but realization remains inconsequential. Examples of MM SP are Vodafone (myCampaign), Telenor or 3 in Austria. For the MIBP SP role there were some approaches, such as Vodafone Terenci in Germany or in&phone in Switzerland. However, none of the MNO decided to consequently fulfill this role, just as for the MCRM SP role.

The emphasis of the variant *Strong MNO* is placed on developing new business areas and revenue sources. This could, for instance, lead to the NFC parking ticket – combined with a specially targeted advertisement – being offered for free by a retailer to an unknown customer who is interested in the topic, possesses a certain level in the loyalty program and enters the nearby parking garage. Other examples could be cross-company mobile couponing strategies or free Internet access for a highly profitable mobile banking customer. The same is true for the mobile-integrated business process that provides hardware, software, organizational design, and network access with QoS-based billing in a combined way and thus realizes authoritative OPEX savings for the field service or the logistics chain of a company. As a general characteristic of this variant, intelligent role combinations could create a number of inter-organizational business models for MNO, leading to new direct and indirect revenues.

If the roles of groups (2) and (3) are not occupied by the MNO, the variant *Weak MNO* occurs (the actors are shown in Fig. 14 with dashed lines, plus the MNE). In this case, the MNO loses the central customer ownership to new actors. These are typically companies with a strong customer relationship from their core business, such as dominant search engine operators (Google), device manufacturers (Apple) or social networks (Facebook). These new entrants can in principle perform the roles of groups (1b), (2), and (3) instead of the MNO, plus the role

of the device manufacturer if applicable. In this case, the MNO would be enclosed by the NEW ENTRANT and lose the central customer ownership.

Figure 14 summarizes the previously described scenario MNE in its two variants *Strong MNO* and *Weak MNO*.

## 5 Summary and Outlook

This contribution analyzes value creation in the mobile market. Based on an analysis of the world’s largest 30 MNOs, of additional market players and influence factors, activities and roles were derived and related to each other with regard to their value flows. Based on the case study and value-flow analysis, a reference model at the role level was developed. For the development of future scenarios, scenario planning was used in order to provide and evaluate a morphological box as an additional tool. The application of the reference model was shown with a combination of both tools in the exemplary development of a future scenario. For this purpose, actually existing innovative sub-scenarios from various international markets were used and aggregated into one future scenario.

For researchers, the result of this paper allows for structured analysis and comparison of case studies, particularly business models and market configurations. For practitioners, it can be used for the design of future business models and for strategy development.

Future research should enable prediction by means of systematic generation and evaluation of constellations and should also introduce quantitative elements. This would also make it possible to develop methods of IT support for optimal constellations – supporting parameterizable business models and strategies as well as focus on hybrid value creation. Mobile operators as well as a number of other market participants face a high potential here, which could enable them not just to embrace reactive strategies but to actively use the changing environment to their benefit.

## References

- Anderson J, Williams B (2004) Unbundling the mobile value chain. *Business Strategy Review* 15(3):51–57
- Banerjee A, Dippon CM (2009) Voluntary relationships among mobile network operators and mobile virtual network operators. An economic explanation. *Information Economics and Policy* 21(1):72–84

## Abstract

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## Value Creation in the Mobile Market

### A Reference Model for the Role(s) of the Future Mobile Network Operator

In recent years competitive pressure in mobile markets has increased remarkably. New business models and thus new actors have entered the market. This contribution analyzes the re-configuration of value structures and strategies in mobile markets. For this purpose, mobile network operators’ service portfolio is analyzed on the basis of a worldwide survey, and the relevant current and future value creation activities are identified with consideration of additional actors and influence factors. On that basis, roles are developed, linked with regard to value flows and combined to a reference model for the mobile market value net. Subsequently, scenario planning is used to develop a set of criteria for the construction of corresponding future scenarios and the application of the reference model is demonstrated with such a scenario.

**Keywords:** Mobile market, Value activities, Roles, Value net, Value exchanges, Reference model, Future scenarios

- Bartlett A, Jackson NN (2002) Network planning considerations for network sharing in UMTS. In: 3th int conf on 3G mobile communication technologies. IEEE, London, pp 17–21
- Berret M (2009) Herausforderungen der globalen Wertschöpfung am Beispiel der Automobilindustrie. In: Bullinger HJ, Spath D, Warnecke HJ, Westkämper E (eds) Handbuch Unternehmensorganisation – Strategien, Planung, Umsetzung, 3rd edn. Springer, Berlin
- Besanko D, Dranove D, Shanlay M, Schaefer S (2010) Economics of strategy, 5th edn. Wiley, Evanston
- BITKOM (2009) Outsourcing: Arbeitsteilung mit den Besten – Nutzen, Erfolgsfaktoren, Empfehlungen. [http://www.bitkom.org/files/documents/BITKOM\\_Standardpraesentation\\_Outourcing.pdf](http://www.bitkom.org/files/documents/BITKOM_Standardpraesentation_Outourcing.pdf). Accessed 2010-05-09
- BMW (2009) 12. Faktenbericht 2009. Bundesministerium für Wirtschaft und Technologie
- BNNetzA (2011) Jahresbericht der Bundesnetzagentur 2010. Bonn
- Chanab LA, El-Darwiche B, Hasbani G, Mourad M (2007) Telecom infrastructure sharing regulatory enablers and economic benefits. White paper von Booz & Co
- Chaudhury R, Terfloth (2007) The rise of network sharing. Risks and rewards for telecom operators. Oliver Wyman
- Dheghan S, Cooper N (2008) Network sharing – learning to share. [http://www.mobileurope.co.uk/features/113605/Network\\_sharing](http://www.mobileurope.co.uk/features/113605/Network_sharing). Accessed 2010-04-18
- Doebelin S, Dowling M (2007) Horizontal und vertikal integrierte Geschäftsmodelle von Telekommunikationsanbietern und Service Providern. In: Picot A, Freyberg A (eds) Infrastruktur und Services – Das Ende einer Verbindung? Die Zukunft der Telekommunikation. Springer, Berlin
- Eisenhardt K (1989) Building theories from case study research. *Academy of Management Review* 14(4):532–550
- European Union (2001) Einführung von Mobilkommunikationssystemen der dritten Generation in der Europäischen Union. Aktueller Stand und weiteres Vorgehen. Mitteilung KOM (2001) 141 v. 2001-03-20
- European Union (2002) Notice pursuant to article 19(3) of Council Regulation No. 17, Case COMP/C1/N.38.369. *Official Journal of the European Communities* (C189/22) v. 2002-08-09
- Freyberg A (2007) Vertikale vs. horizontale Geschäftsmodelle – Die Sicht der Marktteilnehmer. In: Picot A, Freyberg A (Ed) Infrastruktur und Services – Das Ende einer Verbindung? Die Zukunft der Telekommunikation. Springer, Berlin
- Friedrich R, Spitz BM, Geiser A, Lueddecke A (2001) Delivering on the promise – turning wireless data into a success. White paper Booz Allen Hamilton & GCI Hering Schuppener Group
- Frisanco T, Tafertshofer P, Lurin P, Ang R (2008) Infrastructure sharing and shared operations for mobile network operators – from a deployment and operations view. In: Network operations and management symposium (NOMS), München. IEEE Press, New York, pp 129–136
- Gausemeier J, Fink A, Schlake O (1995) Szenario-Management – Planen und Führen mit Szenarien. Carl Hanser, München
- Gerum E, Sjurts I, Stieglitz N (2003) Der Mobilfunkmarkt im Umbruch. Gabler, Wiesbaden
- Gerpott TJ (2001) Wettbewerbsstrategische Positionierung von Mobilfunknetzbetreibern. In: Silberer G, Wohlfahrt J, Wilhelm T (eds) Mobile Commerce – Grundlagen, Geschäftsmodelle, Erfolgsfaktoren. Gabler, Wiesbaden
- Godet M (2000) The art of scenarios and strategic planning. Tools and pitfalls. *Technological Forecasting and Social Change* 65(1):3–22
- Gordijn J, Akkermans JM, van Vliet JC (2000) What's in an electronic business model? In: Dieng R, Corby O (eds) Knowledge engineering and knowledge management: methods, models and tools. 12th international conf EKAW 2000, Juan-les-Pins. Springer, Berlin, pp 257–273
- Habermann K, Pousttchi K (2009) Requirements on IT business value measures for mobile-integrated business processes. In: Newell S et al (eds) 17th Europ conf on IS (ECIS 2009), Verona, pp 1–12
- Handelsblatt (2010) Apple und Google streiten um mobilen Werbemarkt. <http://www.handelsblatt.com/newsticker/technologie/apple-und-google-streiten-um-mobilien-werbemarkt;2598387>. Accessed 2011-01-07
- Hew S, White LB (2008) Cooperative resource allocation games in shared networks. Symmetric and asymmetric fair bargaining models. *IEEE Transactions on Wireless Communications* 7(11):4166–4175
- Hill CEL, Rothaermel FT (2003) The performance of incumbent firms in the face of radical technological innovation. *Academy of Management Review* 28(2):257–274
- Hufenbach Y (2011) Whitepaper: Europäische MVNO-Märkte im Überblick. Forschungsgruppe wi-mobile, Augsburg
- Hultell J, Johansson K, Markendahl J (2004) Business models and resource management for shared wireless networks. In: 60th IEEE vehicular technology conf (VTC) 5, pp 3393–3397
- ITU (2010) Measuring the information society – the ICT development index. Genf
- Jakopin NM (2006) Einflussfaktoren des Internationalisierungserfolgs von Mobilfunknetzbetreibern. Gabler, Duisburg
- Jaspers F, Hulsink W, Theeuwes J (2007) Entry and innovation in maturing markets: virtual operators in mobile telecommunications. *Technology Analysis & Strategic Management* 19(2):205–225
- Kaplan RS, Norton DP (2008) The execution premium – linking strategy to operations for competitive advantage. Harvard Business School Press, Boston
- Kruse J (1993) Entwicklung des Mobilfunk-Wettbewerbs und Regulierungsperspektiven. In: Kruse J, Haucap J (eds) Mobilfunk zwischen Wettbewerb und Regulierung. Fischer, München
- Maitland CF, Bauer JM, Westerveld R (2002) The European market for mobile data. Evolving value chains and industry structures. *Telecommunications Policy* 26(9–10):485–504
- Mellewigt T (2003) Management von strategischen Kooperationen. Gabler, Wiesbaden
- Moerman PA, Commandeur HR, Langerak F (2009) Strategische Zusammenarbeit mit industriellen Zulieferern. In: Bullinger HJ et al (eds) Handbuch Unternehmensorganisation – Strategien, Planung, Umsetzung. Springer, Berlin
- Nalebuff B, Brandenburger A (1996) Co-opetition. Doubleday, New York
- Ohler A (2010) Aufbau neuer Netze – Mobilfunk wollen so gern kuscheln. *Financial Times Deutschland*. <http://www.ftd.de/itmedien/it-telekommunikation/aufbaueuernetze-mobilfunkwollen-so-gernkuscheln/50159950.html>
- Olla P, Patel NV (2002) A value chain model for mobile data service providers. *Telecommunications Policy* 26(9–10):551–571
- Park J-S, Rye K-S (2005) Developing MVNO market scenarios and strategies through a scenario planning approach. In: Proc of the 7th international conf. on advanced communication technology (ICACT 2005), vol 1. IEEE Press, New York, pp 137–142
- Payne A, Frow P (2006) Customer relationship management: from strategy to implementation. *Journal of Marketing Management* 22(1–2):135–168
- Pelkmans J (2001) Making EU network markets competitive. *Oxford Review of Economic Policy* 17(3):432
- Peppard J, Rylander A (2006) From value chain to value network. Insights for mobile operators. *European Management Journal* 24(2–3):128–141
- Picot A (2006) Konvergenz und Restrukturierung der Telekommunikations- und Medienindustrie. In: Hess T, Doebelin S (eds) Turbulenzen in der Telekommunikations- und Medienindustrie: Neue Geschäfts- und Erlösmodelle. Springer, Berlin
- Pousttchi K (2008) A modeling approach and reference models for the analysis of mobile payment use cases. *Electronic Commerce Research and Applications* 7(2):182–201
- Pousttchi K, Hufenbach Y (2009) Analyzing and categorization of the business model of virtual operators. In: Hu X, Scornavacca E, Hu Q (eds) Proc of the 8th international conf on mobile business (ICMB 2009). Los Alamitos, IEEE Computer Society, pp 87–92
- Pousttchi K, Thurnher B (2006) Einsatz mobiler Technologie zur Unterstützung von Geschäftsprozessen. In: Sieck J, Herzog MA (eds) Wireless communication and information. Shaker, Berlin
- Pousttchi K, Wiedemann DG (2009) Mobile marketing management – marketing objectives, types and implementation techniques. In: Pousttchi K, Wiedemann DG (eds) Handbook of research on mobile marketing management. IGI Global, Hershey, pp 1–9
- Porter M (1992) Wettbewerbsvorteile (Competitive advantage): Spitzenleistungen erreichen und behaupten, 1st edn. Campus, Frankfurt
- Porter M (2001) Strategy and Internet. *Harvard Business Review* 79(3):62–78
- Portio Research (2011) Mobile factbook 2011. <http://www.portioresearch.com/Portio%20Research%20Ltd%20Mobile%20Factbook%202011.pdf>. Accessed 2011-04-29
- Riedl R, Roithmayr F (2007) Zur Verbreitung der Fallstudie in der Wirtschaftsinformatik. In: Lehner J, Zelewski S (eds) MKWI 2006, GITO, pp 35–60
- Ritchey T (2011) General morphological analysis. A general method for non-quantified modelling. <http://www.swemorph.com/pdf/gma.pdf>. Accessed 2011-05-08
- Roubelat F (2000) Scenario planning as a networking process. *Technological Forecasting and Social Change* 65:99–112
- Sabat HK (2004) Mobile virtual network operators drive scale and scope economies. *IIMB Management Review* 16(2):5–19
- Sabat HK (2008) Why different carriers adopt different spectrum acquisition strategies. *Information Technology and Management* 9(4):251–284
- Schmidt F, Rommel W (2002) Regulierung zwischen Dienste- und Infrastrukturwett-

- bewerb. Multimedia und Recht (MMR) 5(4):225–230
- Schmitz M (2008) Wie ein Sack voller Flöhe – Mobilfunkbetreiber müssen trotz fragmentierter Wertschöpfungskette die Kontrolle behalten. DMR. [http://www.detecon-dmr.com/de/print.html?unique\\_id=194018](http://www.detecon-dmr.com/de/print.html?unique_id=194018). Accessed 2010-05-27
- Schnell R, Hill P, Esser E (2008) Methoden der empirischen Sozialforschung, 8th edn. Oldenbourg, München
- Seckler R (2005) Mobile Strategy aus Sicht eines Providers – Grobe Stoßrichtungen. In: Giordano M, Hummel J (eds) Mobile Business – Vom Geschäftsmodell zum Geschäftserfolg. Gabler, Wiesbaden
- Shin DH (2008) Overlay networks in the west and the east: a techno-economic analysis of mobile virtual network operators. *Telecommunication Systems* 37(2): 157–168
- Shoemaker PJH (1995) Scenario Planning. A tool for strategic thinking. *Sloan Management Review* 36(2):25–40
- Smura T, Kiiski A, Hämmäinen H (2008) Virtual operators in the mobile industry: a techno-economic analysis. *Netnomics* 8(1–2):25–48
- Srivastava RK, Shervani TA, Fahey L (1999) Marketing, business process, and shareholder value: an organizationally embedded view of marketing activities and the discipline of marketing. *Journal of Marketing* 63(4):168–179
- TalebiFard P, Wong T, Leung VCM (2010) Access and service convergence over the mobile Internet – a survey. *Computer Networks* 54(4):545–557
- Turowski K, Pousttchi K (2004) Mobile Commerce – Grundlagen und Techniken. Springer, Heidelberg
- TNS Infratest (2008) Mobilfunk-Nutzungsverhalten in Deutschland 2008. Repräsentative Umfrage im Auftrag von E-Plus
- Ulset S (2002) Mobile virtual network operators. A strategic transaction cost analysis of preliminary experiences. *Telecommunications Policy* 26(9–10):537–549
- Urban T (2003) Erklärung und Gestaltung von Telekommunikationsnetzwerken. In: 5th European conf of young research and science workers in Transport and Telecommunication, Transcom, Zilina
- Varoutas D, Katsianis D, Spichopoulos T, Stordahl K, Welling I (2006) Economic viability of 3G mobile virtual network operators. *Wireless Personal Communications* 36(2):129–142
- VATM (2010) 12. Gemeinsame Marktanalyse. [http://www.vatm.de/uploads/media/2010\\_TK-Marktstudie.pdf](http://www.vatm.de/uploads/media/2010_TK-Marktstudie.pdf). Accessed 2010-12-17
- Vogelsang I (2002) The german telecommunications reform – where did it come from, where is it, and where is it going? Verein für Socialpolitik Annual Meetings, Innsbruck
- Weiss T (2006) Mobile strategies. Understanding wireless business models, MVNO and the growth of mobile content. Futuretext, London
- Wieland RA (2007) Konvergenz aus Kundensicht. In: Picot A, Freyberg A (eds) Infrastruktur und Services – Das Ende einer Verbindung? Die Zukunft der Telekommunikation. Springer, Berlin
- Winkelmann B (2008) Konvergenz von Mobilfunk- und Internetdiensten. Auswirkungen auf Wertschöpfungskette und Geschäftsmodelle des Mobilfunks. Working papers of the Institute for Broadcasting Economics (243). Köln
- Winkler K (2006) Negotiations with asymmetrical distribution of power – conclusions from dispute resolution in network industries. *Physica*, Frankfurt a M
- Xavier P (2001) Licensing of third Generation (3G) mobile: Briefing Paper. ITU workshop on licensing 3G mobile. Genf
- Yin RK (1981) The case study crisis: some answers. *Administrative Science Quarterly* 26:58–65
- Yin RK (2009) Case study research: design and methods, 4th edn. SAGE, Thousand Oaks
- Zoll S, Terfloth C (2007) Neue Geschäftsmodelle im Mobilfunk. Oliver Wyman, <http://www.presseportal.ch/de/meldung/100534790/>. Accessed 2010-04-25
- Zwicky F (1966) Entdecken, Erfinden, Forschen im Morphologischen Weltbild. Knauer-Droemer, München