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The platformisation of the Mobile Services domain and its impact on Mobile Operators´ strategies in the Open Mobile era: an innovative value network model

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Abstract (Italian)

Questa tesi è nata da una collaborazione tra il *Politecnico di Milano* e il *KTH* (Stoccolma, Svezia) come atto conclusivo di un programma di doppia laurea promosso dall´associazione *T.I.M.E*. Lo studio si focalizza sul settore della telefonia mobile in Europa, identificando le grandi sfide strategiche per i *Mobile Operator*.

Le piattaforme per l'erogazione di servizi di telefonia mobile (*mobile services platform*) rappresentano uno dei più importanti paradigmi nel settore, come testimoniato dalla crescente popolarità degli *application store*. Nell'ultimo decennio si è passati da un modello chiuso (*walled garden*) in cui i *Mobile Operator* rappresentavano il punto focale del *value network* (avendo pieno controllo sulla rete e i servizi) ad una situazione in cui gli Operatori promuovono la collaborazione con attori esterni dando origine all´*Open Mobile era*.

Questo trend ha permesso ad aziende come *Apple, Google* e *Facebook* di entrare nel mercato dei *mobile service* promuovendo piattaforme di grande successo (*App Store, Android Market*, etc.). Ciò ha compromesso la posizione centrale degli Operatori che ora rischiano di vedere il proprio ruolo ridimensionato a fornitori di connettività. Il mercato sta vivendo un boom nell'utilizzo dei *mobile service* ma, al tempo stesso, la propensione alla spesa sta calando trainando al ribasso il *mobile ARPU.* Per di più gli Operatori devono fare i conti con gli ingenti investimenti per la progettazione e la realizzazione delle nuove reti 4G basate su tecnologia LTE.

Questo scenario evidenzia quanto sia importante per gli Operatori trovare nuove strategie per mantenere un ruolo di primo piano nel mondo dei *mobile service*. Identificare queste strategie è lo scopo primario della ricerca. Per avere un approccio sistematico al problema, le strategie sono individuate e modellizzate attraverso un modello del *value network* del settore della telefonia mobile che ha le *mobile services platform* come punto focale.

Dal modello emerge che le strategie hanno due scopi principali: combattere la congestione della rete (investendo per migliorare la rete ed acquisire nuovi slot di banda per le tecnologie LTE, facendo contribuire i *Service Provider* agli investimenti di rete ed elaborando nuove tariffe per il traffico dati) e trovare nuove opportunità di redditività (lavorando con i *Service Provider* per offrire servizi di localizzazione, offrendo servizi di *billing* e investendo in *mobile service platform*).

L'elaborato è organizzato come segue. Per primo viene analizzato il settore della telefonia mobile in Europa, esaminandone la configurazione strutturale e i *trend*. Questo schema di analisi è poi applicato al mercato Italiano, analizzato in dettaglio.

Lo studio prosegue esplorando i più importanti contributi accademici riguardo il *value network* per il settore della telefonia mobile e le *mobile services platforms*. Questa parte teorica è affiancata da un'analisi empirica. I seguenti *Mobile Operator* sono trattati come *case study*: *TIM*, *Vodafone*, *Wind* and *Tre* (Italia), *Telia* (Svezia) e *Telenor* (Norvegia). Inoltre viene presa in rassegna la *Wholesale Application Community*. Un prezioso contributo viene dalle interviste realizzate con il top management degli Operatori. Per sintetizzare quanto emerso dall'analisi della letteratura scientifica e dall'analisi empirica, è stata condotta una *SWOT analysis* per individuare l'impatto strategico delle *mobile services platform* sugli Operatori.

Tutti gli elementi finora presi in rassegna (*framework* teorico, *case study* e *SWOT analysis*) costituiscono la spina dorsale per sviluppare il modello del *value network*.

Abstract (English)

This investigation is a joint research project between *Politecnico di Milano* and *KTH* (Stockholm, Sweden) as the final act of a Double Degree program under the patronage of the *T.I.M.E.* association. The paper investigates the European Mobile Telecommunications industry, looking at strategic challenges for Mobile Operators.

Mobile Services platforms represent one of the most important paradigms in the industry, as confirmed by the growing popularity of the application stores. During the last decade Operators have shifted from a closed model (*walled garden*) in which they were the central focus of the value network (having full control on the network and the services running on top of it) to a situation where they promote the collaboration with external actors giving birth to the *Open Mobile era*.

This trend has allowed companies as *Apple, Google* and *Facebook* to enter into the mobile services domain and promote successful platforms (*App Store, Android Market*, etc.). This has compromised Operators' position and now they risk seeing their role reduced to mere access providers. Mobile services usage is experiencing a boom but, at the same time, users' willingness to pay has reduced lowering the mobile ARPU. Moreover Operators have to deal with the important investments to develop and roll out the new 4G networks based on LTE technologies.

This scenario highlights the importance to investigate how Operators can adopt successful strategies to keep on playing a meaningful role in the Mobile Services domain. Identifying these strategies is the primary goal of this investigation. To have a systematic approach to the problem, the strategies are detected and modeled by a value network model encompassing the Mobile Telecommunications industry and having mobile services platforms at its focal core.

From the model it emerges that Operators´ strategies revolve around two main drivers: defeating networks congestion (investing in network upgrade & spectrum auctions, charging Service Providers for HQ delivery services and elaborating data price plans for mobile customers) and finding new revenue opportunities (working with Service Providers to offer Location-based services, offering charging services to interested parties and developing Mobile Services platforms).

The investigation starts with an overview on the European Mobile Telecommunications industry, looking at structural configuration and trends. Then this analytical approach is applied to the Italian market, which is analyzed in detail.

The research proceeds exploring the most important academic contributions about value network models for the Mobile Telecommunications industry and mobile services platforms. This theoretical part and is complemented with an empirical analysis. The following Mobile Operators are chosen as case studies: *TIM*, *Vodafone*, *Wind* and *Tre* (Italy), *Telia* (Sweden), *Telenor* (Norway). The *Wholesale Application Community* is analyzed as well. Much information comes from interviews realized with Operators´ top management. To collect what emerged from the theoretical and empirical analysis, a SWOT analysis has been performed to understand the strategic impact of mobile services platforms on Operators.

All the previous parts (theoretical framework, case studies and SWOT analysis) constitute the backbone to develop the value network model.

Executive summary

Problem background

The Mobile Telecommunications industry is a fascinating world that is evolving vey fast and has to cope with substantial technological innovations (i.e. the shift towards 4G networks) as well as meet consumers' requirements and guarantee 24/7 services. The primary actors of this industry are the Mobile Operators who introduced the first mobile offerings in the early 1980s. Since then, they have been growing by duplicating network facilities and overlapping coverage areas, due to the absence of a single incumbent providing universal coverage (as in the Fixed industry). The traditional approach was to own and control a network where resources are deployed and operated just by the owner. Therefore the ownership of spectrum and the ownership of customers came to constitute the two most crucial Mobile Operators' assets.

In the last decade they have been shifting from this "closed" approach (*walled garden*) to new business models promoting the collaboration with external actors (i.e. Service Providers). As a consequence, the value network has assumed a modular configuration where the assets are spread among the various actors. To describe this phenomenon scholars use the term *Open Mobile era*.

This trend has implications in different domains: network development and management (where Operators are moving towards network sharing), wholesale market (openness in this market has allowed Operators to sell network capacity and has given birth to Mobile Virtual Network Operators) and mobile services[1] (mostly VAS). This last domain is very interesting to investigate as this tendency towards openness has allowed companies as *Apple, Google* and *Facebook* to enter into the mobile services market and promote successful platforms[2] to deliver Mobile Services (*App Store, Android Market*, *Facebook mobile*) that have been able to conquer the consumers market. Even the giant *Amazon* has recently announced its platform, fully compatible with *Android*. These platforms can be named as Mobile Services platforms and nowadays represent one of the most important paradigms in the industry, as exemplified by the explosion of the *Application Stores*.

Mobile Services platforms are not an unknown phenomenon for Mobile Operators, which have been developing their own platforms too in the last decade. What they have usually done is to implement integrated solutions with high entry barriers for third parties to offer services users can access through a browser on the mobile device. These platforms can be classified as *Mobile Portals* and the most famous one is *Vodafone Live!*, launched in 1999. In the *Open Mobile era* this "closed" business model is out-of-date as openness towards third parties is the key success factor of every platform project.

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[1] Mobile Services are electronic services where a server (Service Provider) provides the required functionality to the user (who might use a Mobile Application as a client) through a device connected to a wireless network. They can be split into voice and data services (see 1.1.3).

[2] A platform can be seen as an entity that holds an environment (hardware and software solutions often organized in reusable modules) able to coordinate the interactions between complementors and end-users both in a technological and organizational way.

This scenario depicts a critical position for Operators for many reasons. First, their revenues are threatened as the mobile ARPU[3] has been declining (-20% in the last three years in Europe). Second, as mobile services are experiencing a boom and data traffic is increasing exponentially, Operators need to cope with these trends by heavily investing in the network infrastructure, as in the case of the new 4G networks based on LTE technologies

Overall Mobile Operators' profits are at stake. Nevertheless this is just the top of a much bigger problem. Indeed, due to players as *Apple, Google* and *Facebook* entering into the mobile services domain, Mobile Operators are seriously risking of loosing control over the value created on their infrastructure seeing their roles reduced to mere access (commodity) providers. They are now at the crossroads of maintaining *dumb pipes* on the one hand, and finding sources of additional revenue on the other hand. From these observations the following questions emerge:

In the Open Mobile era, how can Mobile Operators defend their position in the value network? How can platforms play a strategic role to achieve this objective?

These questions sketch the problem and lead the whole investigation.

Objectives

The research aims at answering the above questions by developing a value network model for the Mobile Services domain. Therefore the model itself is not the main result of this investigation but rather a powerful tool to discover and map new ways Operators can have business relationships with other actors. The advantage of this approach is to have a systematic and structured way to identify possible Operators´ strategies to defend/re-invent their position in the value network by mapping them into the model. To achieve this purpose, the model has to have platforms at its core, be as accurate as possible both by encompassing a large number of actors and by tracking new ways of cooperating among them.

This main goal is coupled with other sub-goals, related to the different parts of the investigation:

- Developing a deep understanding about the European Mobile Telecommunications industry adopting an analytical scheme that distinguishes between static aspects (structural configuration) and dynamic sides (trends for the future). This part is handled in Chapter 1.
- Applying this analytical scheme to a more specific case, looking more at quantitative rather than qualitative data. The chosen market is Italy and this analysis is handled in Chapter 2.
- Developing an innovative way to categorize and graphically represent the most important academic papers dealing with Mobile Services platforms to have a quick overview on the current knowledge about the topic. This part is handled in Chapter 3.

[3] Average Revenue Per Unit.

- Complementing the theoretical analysis with an empirical investigation to have an even stronger basis for the model. Therefore several case studies are analyzed in Chapter 5.

Boundaries of the investigation

The above-mentioned questions stress that Mobile Services platforms hold the focal position in the investigation. Setting the boundaries of this work allows dealing with the problem in the most effective and clear way. Therefore an appropriate frame of reference is defined:

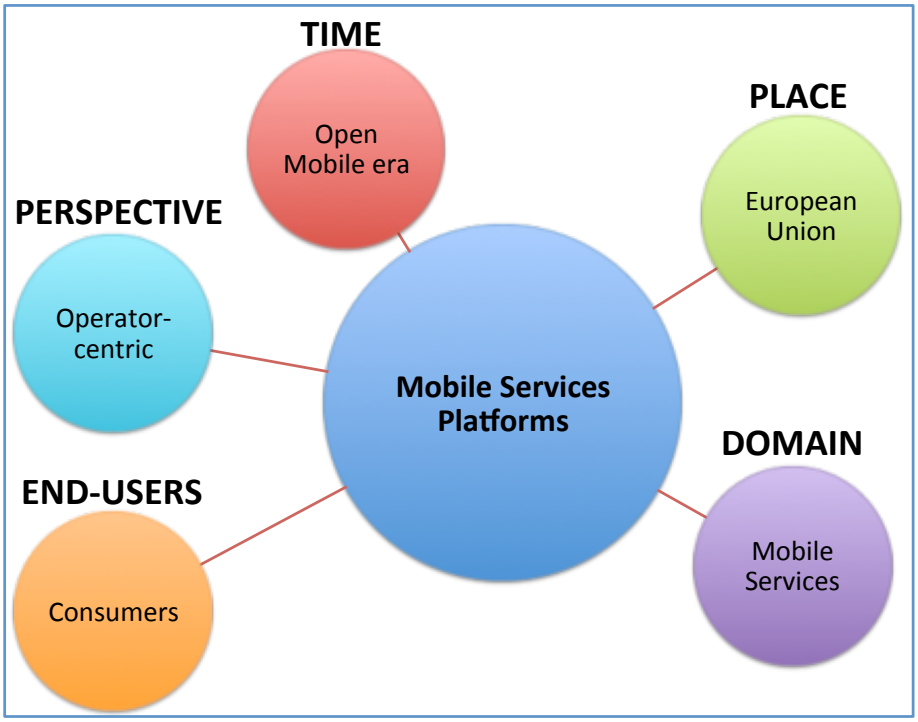

Figure 1 The frame of reference

- **Domain: Mobile Services.** The focus is on Mobile Services[1]. Platforms are intended as strategic tools to deliver just Mobile Services and nothing else: gaming platforms, etc. are not taken into consideration.
- **End-users: consumers.** No B2B Mobile Services are encompassed. Consumers represent the only end-users.
- **Place: the EU.** The geographic context is limited to the European Union. Therefore, despite many European Operators have global presence, the focus is just on their operations within the EU. This choice has the following reasons:
    - The global Telecommunications market has many differences (both technological and related to users behavior) among Europe, US and Asia. Therefore, to address the problem in a more effective way, one of these frames of reference has to be chosen.
    - Europe is where the two Institutions heading this research operate. Therefore it is more interesting to investigate the European market rather then the others. This choice allows also being "closer" to the market, releasing interviews with the Operators, etc.

Particular attention is given to **Italy**, which has been chosen as ideal candidate to be further investigated. This choice is motivated by its market characteristics, which makes Italy one of the most advanced Mobile Telecommunications markets in Europe and a fertile ground for new generation Mobile Services.

- **Time: Open Mobile era.** Platforms are intended to be open: "ecosystem" where collaboration among actors comes is the first key for success[4].
- **Perspective: Operator-centric.** The whole Mobile Telecommunications industry is taken into consideration but the attention is mainly on Mobile Operators with the goal of identifying their main strategic challenges. Therefore an Operator-centric perspective characterizes the whole investigation. More precisely, the focus is on Mobile Network Operators, rather than Mobile Virtual Network Operators[5]. Indeed, it is more interesting to investigate the former rather than the latter because:
    - Virtual Operators are a highly country-specific phenomenon in Europe, where a wide range of business models is implemented. Therefore drawing general conclusions strategies for European Mobile Virtual Operators is not possible.
    - In most of the European countries, Virtual Operators account for a marginal part of the market (as in Italy where they represent just 4% of the mobile market[6]).
    - Mobile Network Operators own the network infrastructure. This aspect has wide implications on their strategies. Therefore choosing "traditional" rather then Virtual Operators allows having a wider and more meaningful approach, encompassing both technological and market-related strategies.

[4] For more details, see 1.2.1.
[5] For more details, see 1.1.1.
[6] For more details, see 2.2.2.

Structure of the investigation

Overall the investigation follows process articulated in five phases (Figure 2).

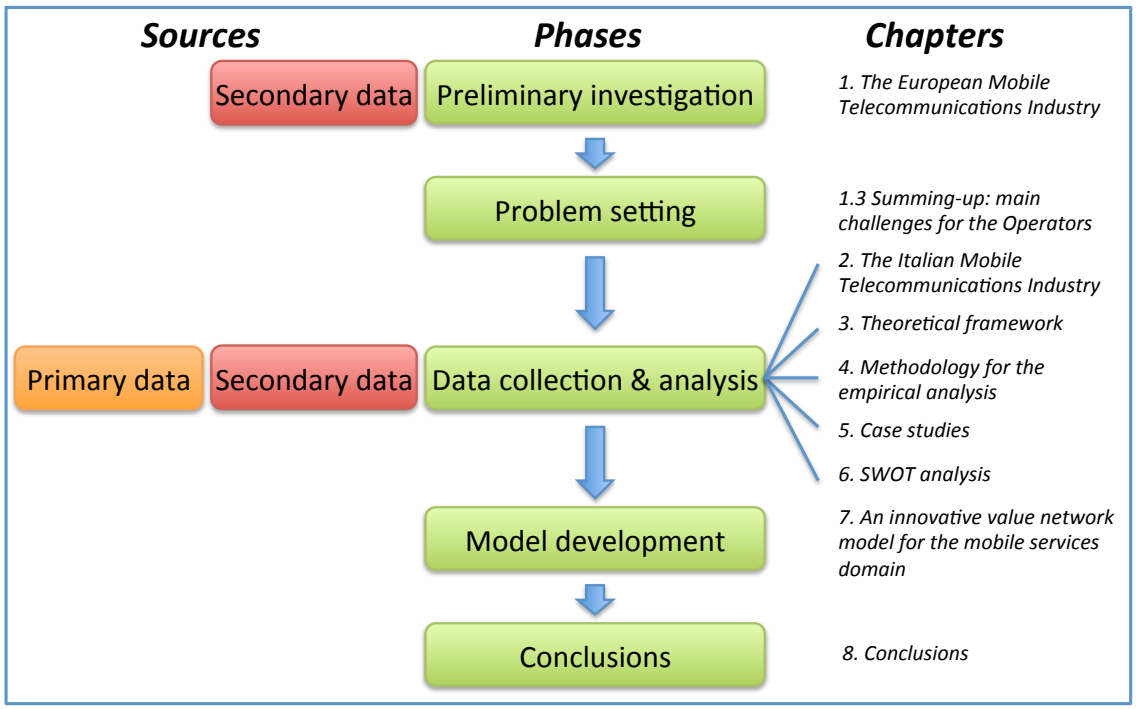

Figure 2 Structure of the investigation

Preliminary investigation

The first part of the research aims at studying the Mobile Telecommunications industry. This investigation aims at exploring the following variables:

- **Static**: structural characteristics of the industry. The research clarifies which are the actors, network technologies, services, devices and end-users.
- **Dynamic**: current trends in the industry. The investigation looks at the shift from walled to open garden in the Mobile Services domain, the impact of Virtual Operators, fixed-mobile convergence, fixed-to-mobile substitution, the impact of mobile payment initiatives in Operators' strategies, the possibilities enabled by new 4G networks and the debate on net neutrality.

This analytical framework gives a complete map of industry, using mostly secondary data and following a qualitative approach. The main results are shown in Chapter 2.

Problem setting

The preliminary investigation allows identifying main problems Mobile Operators are facing. Problems are highlighted and questions guiding the investigation are formulated (this part is handled in the last paragraph of Chapter 2):

In the Open Mobile era, how can Mobile Operators defend their position in the value network? How can platforms play a strategic role to achieve this objective?

The purpose of the investigation from now on is to answer the above questions by developing a value network model for the Mobile Services domain.

Data collection & analysis

Set the problem and the approach to solve it clear, a lot of information has been collected and analyzed within the specific topic of the Mobile Services platforms operating in value networks. This phase is organized in four steps:

- **Analyzing the Italian Mobile Telecommunications industry.** The analytical scheme used to analyze the Mobile Telecommunications industry in Europe is applied to the Italian market with the goal of having a more quantitative (rather than qualitative) approach and to have a full understanding of one the most advanced telecommunications market in Europe. This part is handled in Chapter 2.

- **Developing a theoretical framework.** The overall objective of the investigation is to answer to the questions formulated before by developing a value network model that has Mobile Services platforms at its core. To accomplish this task, building a valid theoretical framework is needed. This framework has two pillars:

    - Developing knowledge about how the Mobile Telecommunications industry can be modeled as a value network. This part starts with an overview on the value network concept and its general model for service industries and then focuses on the Mobile Telecommunications industry.

    - Investigating how the platform concept is applied to the Mobile Services domain and which are the actors involved. This part develops a common nomenclature (defining what platforms mean, looking at the difference between mobile services, contents and applications and applying the platform concept in the Mobile Services domain), deeply analyzes the literature on this specific topic (the most relevant papers are mapped in a diagram) and highlights the most important contributions.

  This step is handled in Chapter 3 and just secondary data are used.

- **Exploring interesting case studies.** Case studies allow complementing the previous theoretical approach with a more practical investigation that looks at Operators´ actual challenges in their market. Considering both aspects gives the model a solid base.

  To keep the Operator-centric perspective, a proper sample of European Mobile Operators has been chosen. First the four Mobile Operators operating in Italy (*TIM*, *Vodafone Italia*, *Wind* and *Tre Italia*) are analyzed**.** This sample allows having a complete overview on the Italian market as they together account for the 96% of the market share in the country. These case studies are developed with both primary and secondary data[7].

  Nevertheless looking just at the Italian market is quite limitative as the investigation aims exploring the whole European context. Therefore the above-mentioned case studies are coupled with others, involving major

[7] More details about primary and secondary data are discussed later (see Sources).

European Telecommunications groups: *Telia* and *Telenor.* The former is headquartered in Sweden and is particularly interesting to be analyzed because is the first in the world to launch 4G services. The latter is headquartered in Norway and has Sweden among its most important markets (i.e. launching 4G services, etc.). In addition, an interesting initiative headed by many Mobile Operators on a global scale (*The Wholesale Application Community*) is explored. To develop these case studies just secondary data[7] are used.

Figure 3 Case studies

This step is handled in chapter 4 (showing the methodology followed in the empirical analysis) and chapter 5 (dealing with the case studies).

- **Performing a SWOT analysis.** The two previous steps identify important theoretical and practical hints to develop the value network model. Anyway one more step has be done by analyzing more specifically the strategic impact of Mobile Services platform initiatives on Mobile Operators. These factors have to be taken into account as well while developing the model. The main contributions of this steps involve the following areas:
    - **Operator perspective**. Discussing Operators' internal factors (strengths and weaknesses) allows keeping the Operator-centric perspective that characterizes the whole investigation.
    - **Current trends**. Considering the external factors (opportunities and threats in the Mobile Services domain) gives a better understanding about ongoing trends.

  Primary and secondary data[7] are used. This step is handled in Chapter 6.

Model development

Using the body of knowledge built in the previous phase, the problem is addressed in a systematic way by developing a value network model to map Operators´ behavior and thus, being able to answer the questions leading the investigation. It is important to point out that the theoretical background, the case studies and the SWOT analysis all concur in developing the value network model, as shown in Figure 4. This model has Mobile Services Platforms at its core and is used to identify and map Operators´ strategic challenges for the future.

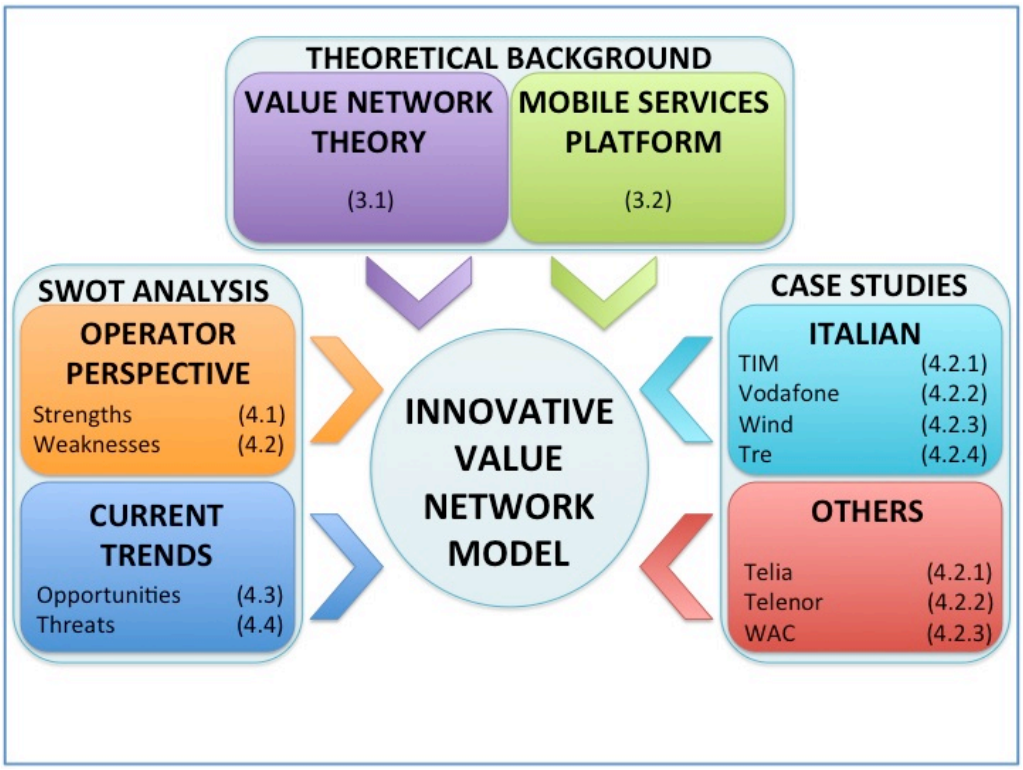

Figure 4 An innovative value network model. The approach

This phase is organized in the following steps:

- **Choosing the methodology.** To design and analyze a value network model, a proper methodology has to be selected. Here the choice is the *e³value* methodology.
- **Developing the model.** The development process follows a simple guideline: start with a model as simple as possible and progressively add complexity to it, aiming to obtain a final configuration as similar as possible to the reality. Coherently with this approach, the first task is to identify the actors operating in the Mobile Services domain. This is done in three phases, starting from a core network that is progressively enlarged. Subsequently value activities are explored for each actor.
- **Comparing the results with existing models.** The model developed in the previous step is compared with other existing models to assess similarities and differences.

- **Drawing conclusions.** The final step consists of identifying the most important contributions coming from the model. This analysis is divided in two parts:
    - How the model contributes to the current knowledge about Mobile Services platforms;
    - How the model can be used to identify and analyze current and future strategic challenges for Mobile Operators in a structured way. The strategies that emerge from the model are not considered just as theoretical but they are related to what the Operators analyzed in the case studies are actually doing or have plans to do.
- **Looking beyond the model**. Some of the strategies identified at the previous step may undermine Operators´ relationship with end-users. Indeed Operators' strategies will likely revolve around end-users data, which are, on one side, source of interesting business opportunities (advertisement and location-based services) and, on the other, the center of privacy concerns that Operators will have to surmount.

This step is handled in Chapter 7.

Conclusions

The last step consists of gathering together the main findings and highlighting the biggest contributions of the research (Chapter 8).

Sources

The investigation is based on a massive analysis of the following sources:

- **Primary data:** interviews. Following the above-mentioned Operator-centric perspective, Mobile Network Operators have been chosen as ideal target for the interviews. These data allow having direct confirmations of the main findings of the investigation and are extremely important to develop case studies. The chosen following Operators have been interviewed:
    - **Italian Mobile Network Operators**. All the Italian Operators (*TIM, Vodafone, Wind* and *Tre*) have been interviewed (for the information about the interviewee see Table 1).
    - **Swedish Mobile Operator**. No details can be released in this report for specific will of the company. Therefore name of company and name of the interviewee are kept anonymous. This interview has a great value too as it has been used throughout the investigation to identify common pattern between the Italian market and other markets in Europe.

Operator	Interviewee	Job title	Date
TIM	Egisto Benelli	Vas Marketing Director	12/04/2011
Vodafone Italia	Alessandra De Carlo	Head of Marketing Mobile Data	05/04/2011
Wind	Stefania Carra	Head of VAS Marketing and Business Development	13/04/2011
	Alessandro Lavezzari	Head of Internet Mobile Consumer offering	13/04/2011
Tre Italia	Roberto Forte	Broadband, VAS & Portal Director	14/04/2011

Table 1 Interviews with the Italian Mobile Network Operators

The structure of the interviews is reported in the Appendix.

- **Secondary data**: academic articles (accessible through *Google scholar*), leading business newspapers (i.e. *The Financial Times, The Wall Street Journal*), online news aggregators (i.e. T*elecompaper*, *mocoNews*), white papers by companies operating in the industry (i.e. *TeliaSonera*, *Ericsson*), research papers by telecommunications data collectors (i.e. *ABI research*, *Wireless Intelligence*), white papers/presentations by consultancy companies / advisors (i.e. *Deloitte*, *McKinsey*, *Gartner*). These sources have been monitored on a daily basis during the whole process by activating tools such as alerts and news aggregators. The main idea behind the choice of these sources is to encompass both academic and business sources to have a stronger approach.

Main challenges for European Mobile Operators

Mobile Operators are under pressure for the following reasons:

- **Profits are threatened**. A study by *Wireless Intelligence* (2011b) reveals that mobile ARPU across the 27 European Union countries has fallen by 20% over the last three years, dropping from EUR 25 in 2007 to EUR 20 in 2010. This fall has been caused primarily by ongoing declines in the average per-minute price for voice calls, which dropped from EUR 0.16 to EUR 0.14. Revenue growth from non-voice services has helped to stabilize ARPUs but is not yet fully compensating for falling voice revenue. Non-voice revenue (including messaging) rose by just EUR 1 on average over the last three years to around EUR 6. Within this, mobile data ARPU has doubled to just under EUR 3 but still accounts for less than 15% of total ARPU.

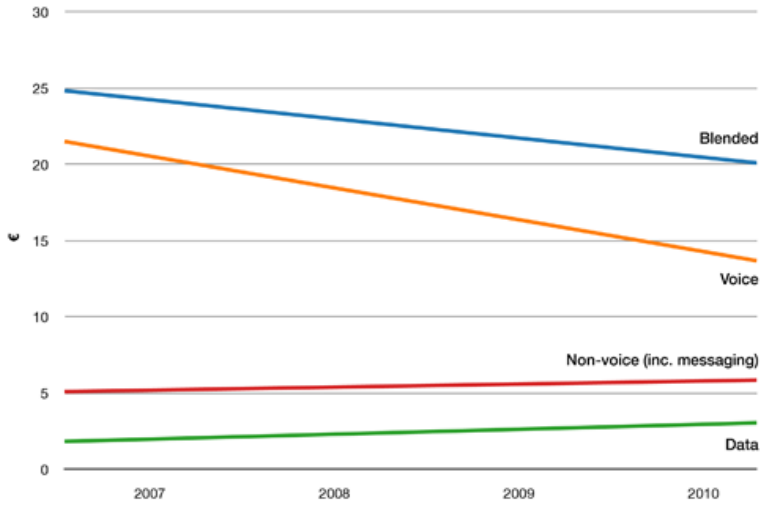

Figure 5 ARPU 2007 – 2010. (Wireless Intelligence, 2011b)

This situation is complicated by the massive 4G-related **investments** (spectrum and network equipment) needed to deal with the problem of network congestion, driven by the increasing diffusion of smartphones and other "data-hungry" devices. Besides these expenditures, *ABI Research* (2011) estimates a 4.2% year-on-year expenditures increase for mobile gateways, subscriber databases, etc. in 2011.

- **The relation with end-users may be compromised.** The *Open Mobile era* has introduced a modular configuration of the value network where assets are spread among the actors. This trend may undermine Operators' relation with end-users, due to the following aspects:
    - **Potential threat of no longer controlling devices.** Consumers may purchase devices through retail channels that are independent of the Mobile Operators' influence. If this occurs, carriers have to quickly adapt despite their fears of changing profit mix (Deloitte, 2010). An additional threat is fueled by rumors around *Apple*'s idea to equip its devices with proprietary SIM cards (Parker, 2010; Lunden, 2010a).
    - **Value is shifting to other services.** The role of voice and broadband access services providers is not satisfactory anymore for the Mobile Operators as these services are more and more perceived as commodities, as confirmed by the revenues decrease.

The current situation pushes Mobile Operators to take some initiative to look for new sources of revenues and this can be done following two alternative strategies:

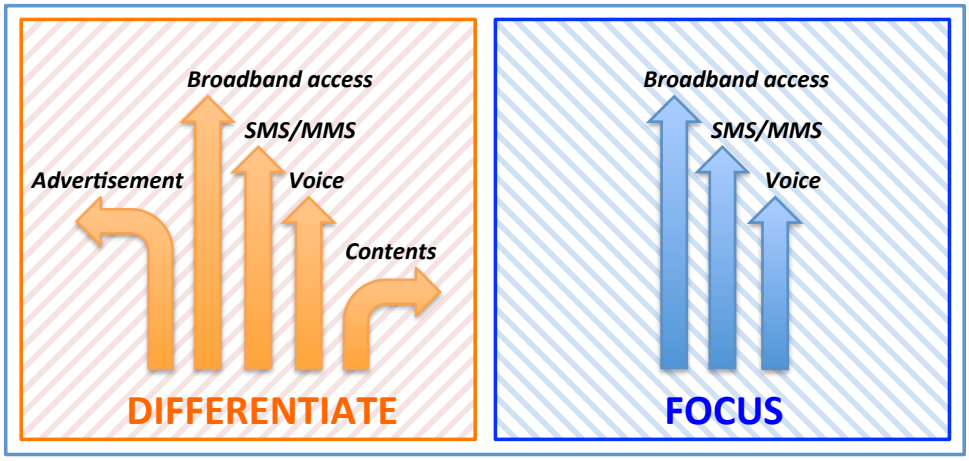

Figure 6 Two alternative mobile services strategies

- **Focus** on "core" services such as voice, SMS/MMS and broadband access. One possible way to boost revenues is to charge premium fees for 4G broadband access services. This is a growing area for the Operators, but still accounts for small part of their revenues (15% of the total ARPU). Operators are working in this direction even by introducing new data plans with higher monthly caps and higher downlink data rates. Another possible initiative is to charge Service Providers (i.e. *Google* for *YouTube*) for guaranteeing high-quality delivery of their services (Parker, 2011b; 2011d). Operators claim these services to be the main reason of data explosion[8] and they are willing to stop Providers' "free lunch". The idea is technically feasible but controversial, as the net neutrality[9] principle is at stake.

- **Differentiate** the offering, encompassing contents and advertisement too. This strategy is not new and Mobile Operators have been following it for the last decade adopting, for example, the Mobile Portal model[10]. This approach is now out-of-date and Mobile Operators are currently confronted with limitations seeking ways to attract larger constituencies by adopting a more open approach (Ballon, Walravens, Spedalieri, & Venezia, 2008). The application store paradigm represents the new challenge for Operators[10].

[8] For more details, see 1.2.7
[9] For more details, see 1.2.8.
[10] For more details, see 1.1.3, 1.2.1.

The Italian Mobile Telecommunications industry

Italy can be considered as the most mature Mobile Telecommunications market among the EU5 for the following reasons:

- **Connections**: highest penetration rate of SIM cards and highest percentage of 3G connections. [11]
- **Voice services**: Italians are the heaviest mobile phone users for voice services. [12]
- **Data services**: highest rate of Mobile Broadband connections. [11]
- **Other mobile services**: Italians are the heaviest users of social networks on a global scale.[13]
- **Devices**: second highest penetration of smartphones after Spain. [11]

These trends are the reason why mobile services usage has been increasing for the last years. While voice and SMS have moderately grown, data services have exploded: +81% [11]. Despite this growth, Italy has performed worse than other countries in terms of **mobile ARPU** [11], which has substantially been falling (-21% in the last four years). This trend is anyway compensated by the high **penetration rate**.

To cope with data explosion, Operators are required to do heavy investments in network infrastructures. **LTE technologies** are ready to be used but Italian Operators are not planning to implement them in the immediate future also because the bands are not going to be auctioned by the end of 2011[14]. *TIM* and *Vodafone* are proceeding on similar paths: they are heavily investing in HSPA+ technologies and planning to start LTE-based commercial offerings at the beginning of 2013. *Tre's* and *Wind*'s role is unclear as there is no actual timeline for implementing HSPA+ and LTE networks.

The **Open Mobile** paradigm is conquering Italy too. The most interesting initiative involves all the Mobile Operators to develop a common mobile payment platform[15] that will allow mobile subscribers to pay for digital contents on Internet (off-portal) with their phone credit.

Virtual Operators play a marginal role: for number and market share Italian MVNOs are extremely behind the other EU5 countries even if the business models are interesting[16]. Thanks to its network, *Tre* is very active as HNO. Some Fixed Operators (as *Tiscali* and *Fastweb*) are approaching the mobile market as Virtual Operators to achieve convergence.

[11] For more details, see 2.1.
[12] Fore more details, see 2.2.4.
[13] For more details, see 2.1.3.
[14] For more details, see 2.2.6.
[15] For more details, see 2.2.5.
[16] For more details, see 2.2.2.

Theoretical framework

The value creation process in the Mobile Telecommunications industry is not as sequential as the one portrayed in Porter's original idea: products and services are designed, created, delivered, and provided to customers via complex processes, exchanges and relationships. To describe this phenomenon the term **value network** is used. These networks are buyer-centric: end-users have the crucial role to pull the network by creating demand and setting the rules of engagement.

Platform is an entity that holds an environment (hardware and software solutions often organized in reusable modules) able to coordinate the interactions between complementors and end-users both in a technological and organizational way. Mobile Services platforms rely on the following actors: Platform Provider (provides and operates the platform), Service Providers (compose services by creating component and/or recombining and reusing modules available in the platform repository), Third Parties (provide raw services that are not intended to be directly accessed by end-users but rather to enrich the Service Providers' offering) and end-users (access and consume services offered by the platform).

To have a quick overview on the current knowledge about the topic of Mobile Services platforms, an innovative way to categorize and graphically represent the most important academic papers (23 in total) is proposed (Figure 7).

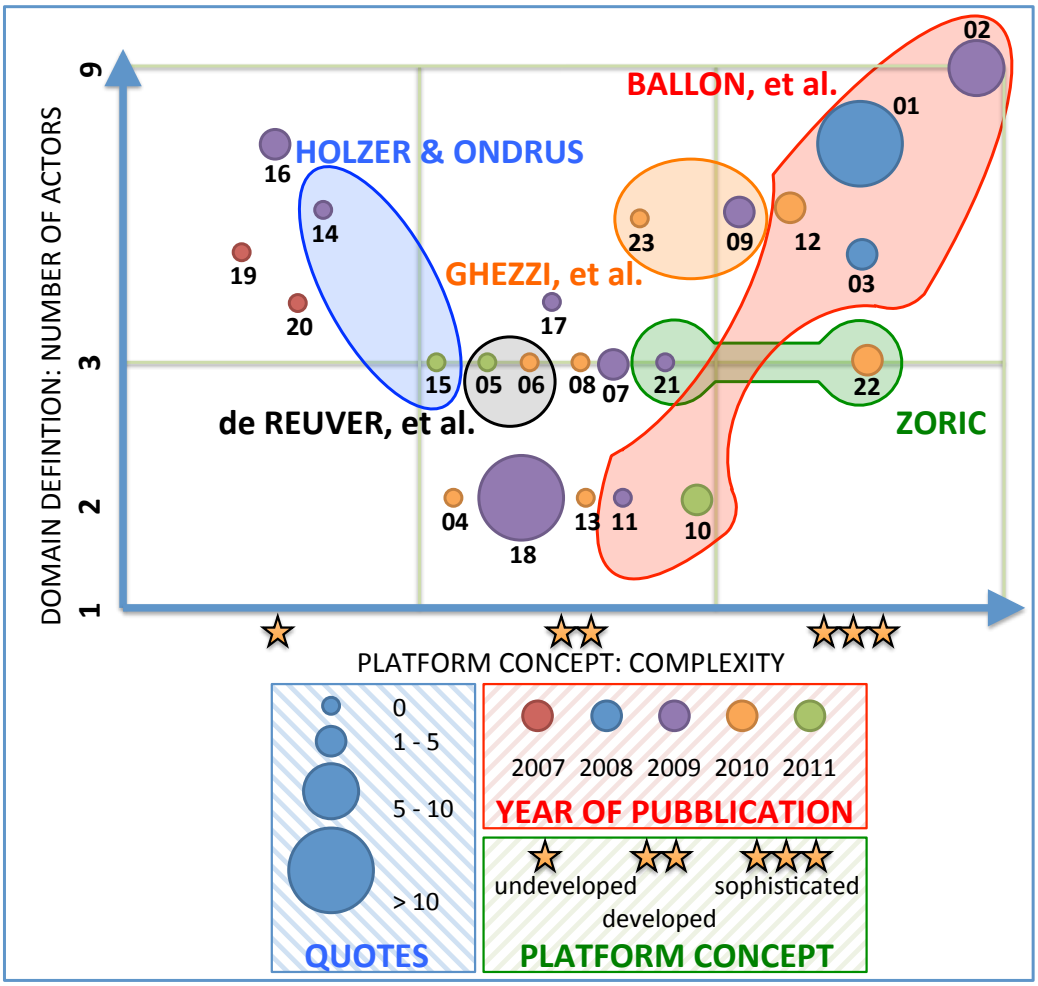

Figure 7 Graphical representation of the academic papers

Empirical analysis

Developing an empirical analysis based on case studies allows finding confirmations about what discovered investigating the literature and connecting the main contents with real-life strategies. More specifically, it allows:

- Finding common patterns among different Mobile Telecommunications markets in Europe.
- Having a more detailed view on Operators' actual problems (i.e. drop in mobile ARPU).
- Understanding how Operators are working to update their networks to meet the growing demand for higher data-rates.
- Looking at Operators´ strategies regarding Mobile Services platforms and similar initiatives.
- Investigating other strategies (besides platforms adoption) Operators have to diversify their revenues.

To reach these objectives, a proper sample of case studies has to be chosen (see Data collection & analysis) and every case study is structured in the most useful way covering these points:

- **Company overview**. This introductory part aims at having a better understanding about the company, its origins and its operations.
- **Financial and operating overview.** The focus of this part is about offering a financial and operating (looking mainly at Mobile AMPU[17] and ARPU[18]) overview of the company to have a better and more quantitative understanding about how Operators' profits are threatened.
- **Network development**. The most important initiatives to roll out 3G and 4G networks are explored, as key success factor for new and sophisticated mobile services.
- **Mobile services platforms**. This part explores Operators´ most important projects within the Mobile services platforms area.
- **Other challenges**. This last section gathers together all the other interesting initiatives headed by Operators that are relevant for the value network model.

[17] The term Mobile AMPU stands for Average Minutes Per User: the amount of time (measured in minutes) the average subscriber talks (or listens) in their phones.
[18] The term Mobile ARPU stands for Average Revenue Per User: the total revenue divided by the number of subscribers

Operators and Mobile Services platforms: SWOT analysis

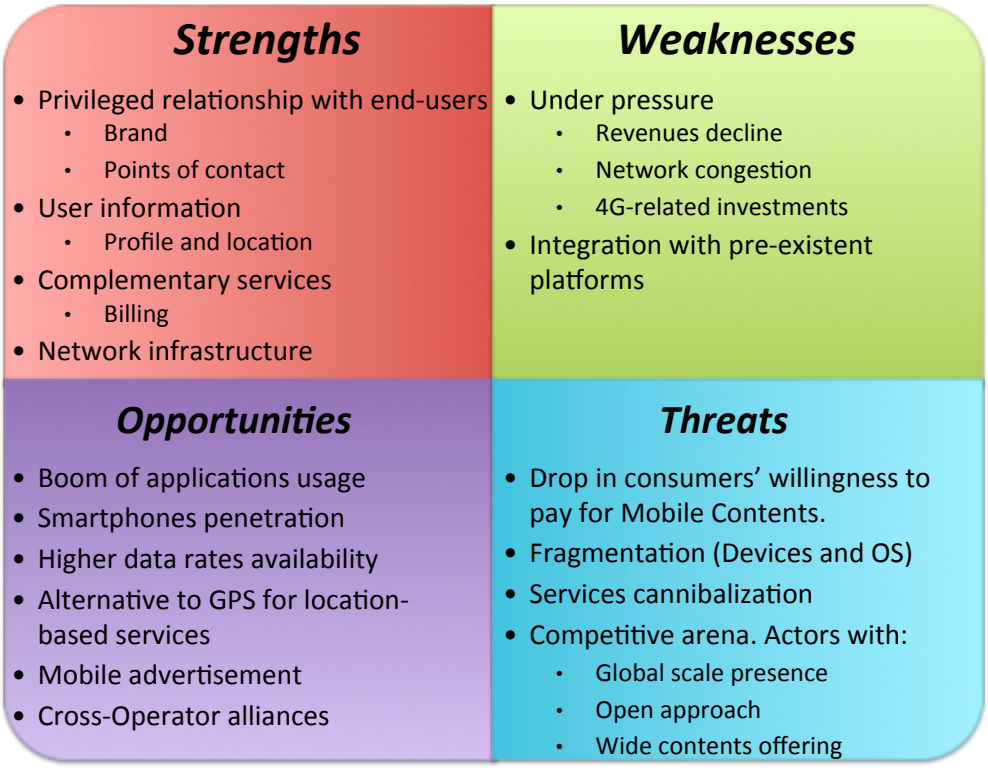

Figure 8 SWOT analysis

The SWOT analysis is a powerful tool to evaluate the strategic impact of Mobile Services platform initiatives on Mobile Operators. Their main strengths are:

- **Privileged relationship with end-users**, due to consumers' familiarity with Operators' brand and points of contact.
- **User information**: Operators have been storing more information on their subscribers (i.e. location, user profile) than banks.
- **Complementary services**: they run a set of services that are complementary to each other (i.e. billing, SMS/MMS, user alerts).
- **Network infrastructure**: they operate networks where mobile services are delivered. This has allowed developing a relevant expertise in the domain.

Nevertheless they have even some weaknesses:

- **Under pressure**, due to revenues decline, network congestion problems and investments needed to upgrade their network with 4G technologies.
- **Integration with pre-existent platforms:** many Operators are facing the difficult task to integrate existing platforms with new solutions.

Looking at the Mobile Services domain, the following opportunities are available:

- **Boom of applications usage**: downloaded applications will grow by 11,7% during 2011 compared with 2010.
- **Smartphones explosion**: during Q4 2010 about 400 mil smartphones were shipped (+16% compared with Q4 2009).

- **Availability of higher data rates** pushed by 4G technologies.
- **Location-based services**: mobile services are moving towards being location-oriented. GPS alone will not be sufficient to support these services therefore other mobile technologies (i.e. Wi-Fi and 3G) will gain traction.
- **Advertisement**: smartphones have expanded the potential of mobile advertisement, as confirmed by the moves of *Google* (*AdMob*), *Apple* (*iAd*) and *Blackberry* (*Advertising service*).
- **Alliances**: Operators have joined forces to develop shared Mobile Services platforms and reduce costs and risks of independent systems.

The Mobile Services domain has the following threats:

- **Drop in users' WTP:** the average price of the applications sold on the four biggest Application Stores[19] declined sensibly during 2010.
- **Fragmentation**: dealing simultaneously with different devices and OS is a further obstacle to develop platforms.
- **Services cannibalization**: VoIP and social networks are spreading more and more and it may cannibalize voice and data services usage.
- **Competitive arena**: actors as *Apple, Facebook* and *Google* can compromise Operators' relationship with end-users.

Overall the Mobile Services domain is experiencing a boom in services usage, coupled with a drop in users' willingness to pay for these services. To deal with this trend and the competitive threats, Mobile Operators need to find monetization methods other than paid (by the users). The technological need for alternatives to GPS as well as the growing importance played by mobile advertisement make possible for Mobile Operators to sell user information (i.e. the location) to interested parties. They have all the resources to play this role as they own the infrastructures where this data flow and their offering (voice, data, etc.) is complementary with this kind of initiative.

Growing smartphones penetration and higher data rate availability support this scenario too, by making possible to obtain targeted advertising within location-based services. The ideal configuration encompasses actors such as Advertisers and Service Providers (that can purchase this information to improve their services or business in general) and users, who get access to more personalized and useful services (i.e. location-based) at a decreasing cost.

Anyway Operators' position is not easy as they are under pressure: while revenues are dropping there is a need for high 4G-related investments to cope with data explosion. Where present, pre-existent platforms are an issue too. For this reasons, industry-wide alliances to build common platform are attractive.

[19] *Apple*'s *App Store* for *iPhone*, *Blackberry App world*, *Google Android Market* and *Nokia OVI store.*

An innovative value network model for the Mobile Services domain

To design and analyze a value network model, a proper methodology is selected: the *e³value*. This methodology provides a semi-formal ontology to represent economic value creation, distribution and consumption in a multi-actor network.

The development process follows a simple guideline: start with a model as simple as possible and progressively add complexity to it, aiming to obtain a final configuration as similar as possible to the reality. Coherently with this approach, the first task is to identify the actors operating in the Mobile Services domain. This is done in three phases, starting from a core network that is progressively enlarged. Subsequently value activities are explored for each actor.

Overall the model identifies and maps the behavior of nine actors (Figure 9): Platform Provider, Platform Sponsor, Third Parties, End-users, Service Providers, Mobile Network Operators, Technology Provider and Payment Service Provider.

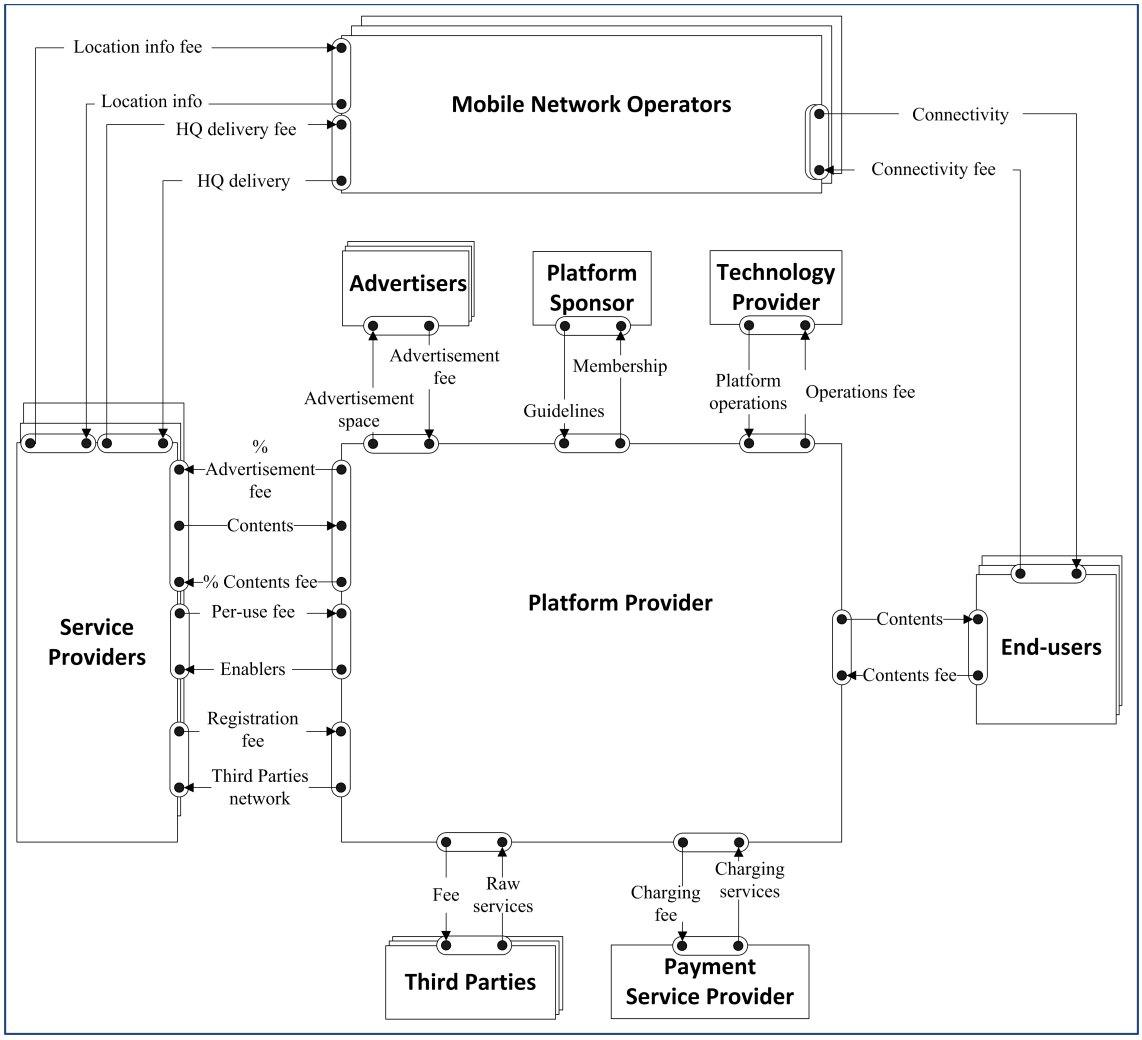

Figure 9 The innovative value network

Moreover every actor is separately represented with its value activities coupled in a meaningful way with the value creation/exchange processes shown in the above figure. Eighteen value activities are identified in total.

Impact on the academic knowledge

The model is a significant contribution to the knowledge of how the Mobile Services domain can be mapped as a value network. Its main value is to be:

- **Complete.** The model represents all the actors and value activities that are relevant in the Mobile Services domain. Assuming the number of actors and value activities as main variables, similar contributions[20] are not as complete as the model.
- **Platform-oriented.** The model is shaped after Mobile services platforms, following one of the most important paradigms in the industry.

Keeping these considerations into account, the model is positioned in the above-described graphical representation (see Theoretical framework) together with the 23 most interesting academic contributions on the topic.

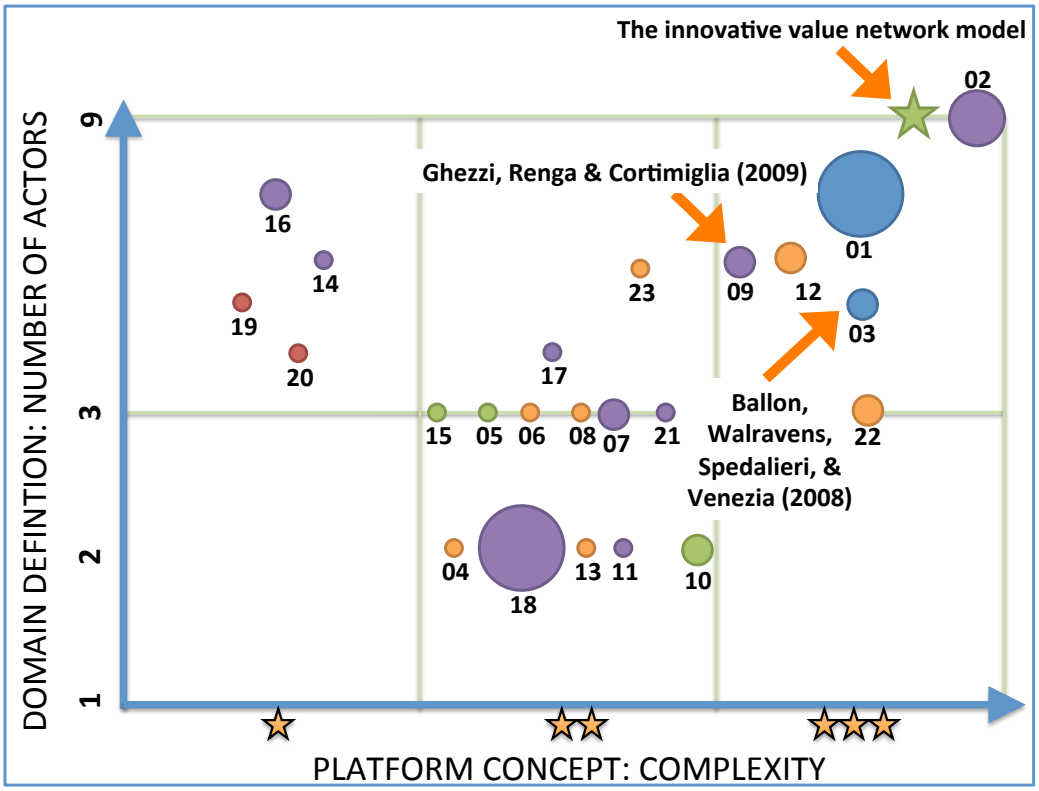

Figure 10 How the innovative value network model can be positioned

Besides these aspects, model biggest contribution is to be **innovative**, in the sense that it tracks new ways of cooperation among actors involved in the value network. An example comes from revenue sharing contracts between Service Providers and the Platform Provider, where not only revenues from contents bur also from advertisement are mapped. Another scenario involves high quality delivery services. In addition, many opportunities come from Location-based services: Operators can monetize their network infrastructure by selling these services to interested parties, Service Providers can develop more advanced services, Advertisers have further incentives to invest in the mobile channel thanks to the possibilities offered by context-aware advertisement, etc.

[20] Ghezzi, Renga & Cortimiglia (2009) and Ballon, Walvarens, Spedalieri and Venezia (2008).

Mapping Operators' strategies

The model allows identifying and mapping Operators' strategic challenges:

- **Invest in the network, optimizing the traffic and dealing with band auctions**. *Telia* and *Telenor* already operate 4G networks and have recently purchased frequency slots at 800 MHz. *TIM* and *Vodafone* that have a clear roadmap for 4G while *Wind* and *Tre* have less clear plans for the future
- **Charge Service Providers for HQ delivery services.** This idea has been widely debated for the last months as it might compromise net neutrality.
- **Introduce new data price plans for mobile customers** by segmenting the market as much as possible and tailor price plans on these segments by introducing unlimited plans with different speed/data guarantees setting apart data plans based on hours/amount of data. *Vodafone*, *Wind* and *Telia* have already adopted this approach. *TIM* and *Tre* have not yet abandoned old-style price plans and still offers data plans charging users per hour.
- **Location-based services** can be a new way of remuneration for Operators. *Telenor* is the Operator having the widest offering of positioning services. *Vodafone* and *Telia* are approaching this business by offering their own navigator services.
- **Provide charging services to interested parties.** Driven by important revenue sharing opportunities, Operators are looking for signing deals with a wide range of actors. *TIM*, *Vodafone*, *Wind* and *Tre* are involved in a joint payment platform initiative. Besides this project, every Operators aims at developing specific deals with Service Providers (i.e. the deal between *TIM* and the *Ovi Store*). Both *Telia* and *Telenor* have a very rich offer too.

Looking at Operators' strategies with Mobile Services platforms, three are the possible approaches:

- **"The parachute": to update the mobile portal.** Operators can update their mobile portals by re-styling, re-organizing contents and making it accessible by smartphones and tablets too. *Tre* is the Operator that better represents it as it is focused just on updating its old mobile portal. *TIM*, *Vodafone* and *Wind* are willing to keep alive their mobile portals but at the same time they are running other interesting projects. *Telia* and *Telenor* have completely discarded the old portals.
- **"Cooperation": to integrate with other platforms**. Operators can collaborate with other actors to play a meaningful role in the Mobile Services domain without direct investments to develop a platform. Two are the possible scenarios:
    - **Create branded stores within existing platforms**. Operators can act as aggregators and open branded stores within existing platforms, as exemplified by *Wind* on the *Android Market*.
    - **Collaborate with Platform Providers to bundle offerings.** Operators collaborate with selected Platform Providers to bundle offerings for Operators´ subscribers. This strategy is exemplified by *Telia*, which has already shut down the old mobile portal and will

not launch any application store; on the contrary it collaborates with external Platform Providers (*Spotify* and *Voddler*) to offer connectivity bundled with music and video services.

- **"Big guns": to develop a platform.** Operators develop and run a Mobile Services platform to compete with the main actors playing in the Mobile Services competitive arena as *Google, Facebook* and *Apple*. This "aggressive" approach is exemplified by *TIM* (with *TIM Store*) and *Telenor* (with its pilot project in Serbia). Both the projects follow the guidelines of the *Wholesale Application Community*.

Platform strategies can be classified looking at Operator´s investment and impact on the value network**.**

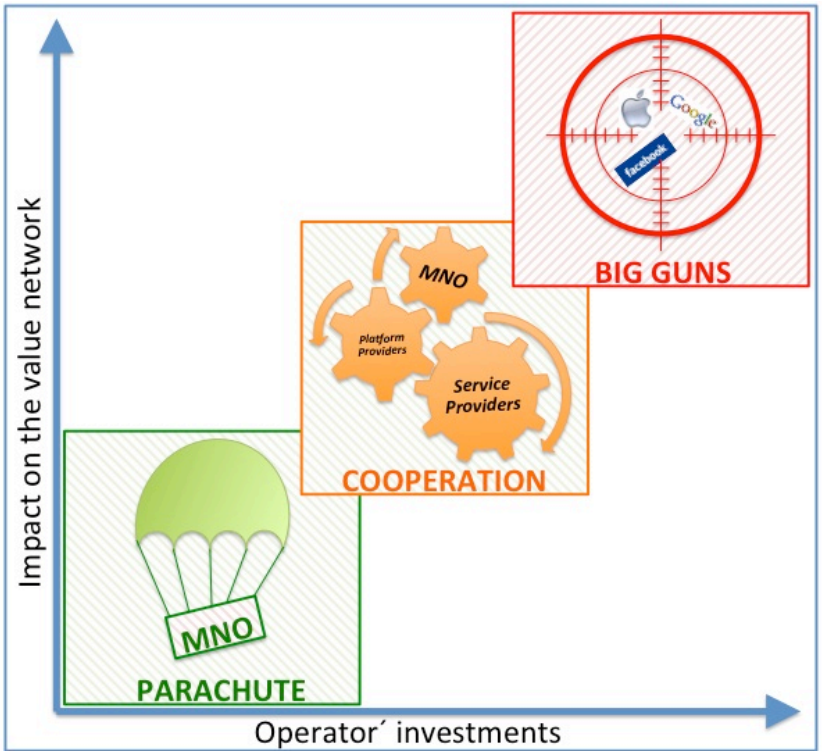

Figure 11 Platform strategies

Conclusions

The main contribution of this investigation is to identify possible strategies that give Operators the opportunity to keep on playing a meaningful role in the Mobile Services domain. This is done in a systematic way, developing an innovative value network model that allows mapping these strategies and their implications. From this analysis it emerges that two are the main driver behind the strategies:

- **Defeating network congestion:** investing in network upgrade, optimization & spectrum auctions, charging Service Providers for HQ delivery services and elaborating data price plans for mobile customers.
- **Finding new revenue opportunities**: working with Service Providers to offer Location-based services, offering charging services to interested parties and working on Mobile Services platforms (updating the old mobile portals, creating branded stores within existing platforms, collaborate with Platform Providers to bundle offerings and develop platforms).

These strategies are not just theoretical but they are related to what the Operators analyzed in the case studies are actually doing or have plans to do.

In the next years, Operators will have to fight for every inch of ground with giants as *Apple*, *Google* and *Facebook*. Moreover revenue sharing contracts will become the dominant paradigm regulating relations among actors.

The model itself has an important impact on the current academic knowledge about the Mobile Services domain because it is complete, platform-oriented and innovative, highlighting unique characteristics compared with other value network models.

Besides this fundamental aspect, this research provides some other minor contributions. First it introduces a schematic approach to analyze the industry distinguishing between structural configuration (actors, technologies, services, devices, end-users) and trends. In addition, this study gives an important methodic approach to classify scientific articles about Mobile Services platform proposing to dimensions of analysis: complexity of platform definition and number of actors involved in the value network.

To conclude, this dissertation gives some good hints to reflect about the delicate topic of shaping strategies after a massive usage of end-users data to provide innovative and sophisticated mobile services. Indeed behind interesting revenue opportunities, there might hide the serious risk of betraying customers´ trust, giving birth to a price competition on the mobile services consumers market and making higher the risk that VoIP and social networks will overcome traditional voice and messaging services.

1 The European Mobile Telecommunications industry

This chapter explores the European Mobile Telecommunications industry[21], aiming to provide a wide and comprehensive view of the industry so as to build the basis for next chapters where the investigation deals with more specific topics.

This analysis follows a specific analytical framework: first the **structural configuration** of the industry is explored (1.1); made industry's structure clear, it is interesting to analyze which are the current **trends** within this domain (1.2). The chapter ends with a short recapitulation of what discovered during the investigation, focusing on the main challenges for Operators (1.3).

1.1 Structural configuration

To understand the structure of the industry, it is important to identify which are the main actors (1.1.1); these players manage networks (1.1.2) to deliver mobile services (1.1.3) to end-users (1.1.5), who access the services through devices such as mobile phones, smartphones, tablets and notebook (1.1.4).

1.1.1 Mobile Operators

The Mobile Telecommunications industry revolves around **Mobile Operators**, which can be distinguished in:

- **Mobile Network Operators** (MNOs). Carriers providing mobile services to end-users and owning licensed spectrum and infrastructure. MNOs that allow MVNOs to access their radio communication infrastructure can be named **Hosting Network Operators** (HNOs) (Cricelli, Grimaldi, & Ghiron, 2010) or **Mobile Virtual Network Enablers** (MVNEs).
- **Mobile Virtual Network Operators** (MVNOs). Carriers providing mobile services without having their own licensed spectrum and infrastructures. They lease wireless capacity from MNOs and establish their own brand names (Shin, 2008). However some MVNOs possess parts of the network infrastructure such as mobile switching centers or home location registers. From a customer's perspective, MVNO's services may sometimes be virtually indistinguishable from those provided by MNOs (Banerjee & Dippon, 2009).

They face two different markets (Banerjee & Dippon, 2009):

- **Wholesale**[22]: the upstream market where MNOs sell wholesale services (network capacity) to Operators that do not have their own network infrastructure (i.e. MVNOs).
- **Retail**: the downstream market where MNOs and MVNOs compete for selling mobile services to end-users.

[21] Mobile industry or Wireless Telecommunications industry can be used as well.

[22] In 2007 the European Commission removed the market for wholesale access to mobile networks (market 15) from the list of markets to be looked into by national regulatory authorities (Banerjee & Dippon, 2009).

Mobile Operators are intended to offer mobile services (see 1.1.3), no matter which technology is implemented. This approach is coherent with 4G (see 1.2.7), which is used broadly to include several types of broadband wireless access communication systems, not only cellular telephone systems (Bajaj, Babbar, Chawla, & Malhotra, 2009).

1.1.2 Network technologies

Despite the focus of the investigation is only about the Mobile Telecommunications industry, some comments about network evolution in the whole (Fixed and Mobile) Telecommunications industry have to be done. In the last years, this industry has been pointing towards **bundling** fixed and mobile services into triple-play (broadband data, fixed telephony and television) or quadruple-play (mobile telephony included) packages. Triple-play (3P) services are provided by Operators adopting an **IP-based platform network architecture**: a common fiber-rich architecture capable of supporting a triple play of voice, video and data. Although media and lower-layer transmission technology vary from network to network, all current commercial deployments use the **Internet Protocol** (IP) suite for higher layer transmission and networking purposes: indeed the services (voice, video, data) are supported as application level data streams on top of this general-purpose data communications platform.

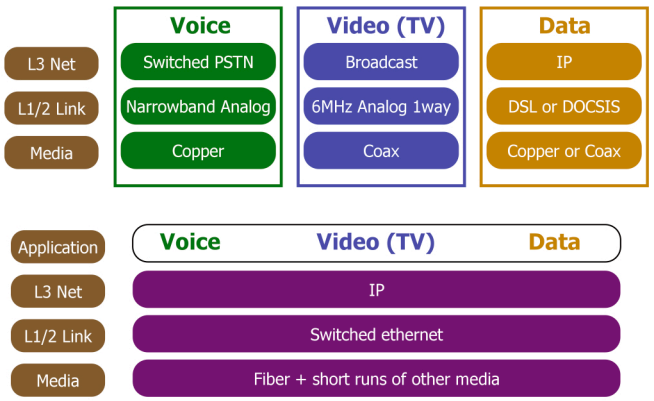

Figure 12 Evolution of wired networks from silos to platform architecture (Lehr & Chapin, 2010)

The IP layer is the common denominator to achieve integration between fixed and wireless network infrastructures too. Indeed in the wireless domain there is a similar trend towards providing a range of services over a common **IP-based wireless network infrastructure**. (Lehr & Chapin, 2010) Above the IP layer, horizontal services can be built, i.e. through platforms (such as IMS[23], see 3.2.3) aimed to facilitate service providing by holding component that can be used and re-used at will. The underlying transmission technologies might be different.

Two are the big families of wireless network technologies:

- **Cellular Networks Technologies**. These networks are organized in cells, each served by at least one base station. Joined together, these cells are able to provide radio coverage over a wide geographic area. In the last ten years,

[23] IP Multimedia Subsystem.

Europe has been experiencing an evolution passing from standards such as **GSM** (2G) to **UMTS** (3G), **HDSPA** (3G advanced or 3.5G), **LTE** (pre 4G), etc. The current in-coming technology is **LTE-Advanced**, included in the 4G standards (see 1.2.7). These network technologies work at different frequencies[24] and this element introduce a certain complexity when it comes to network integration/evolution.

- **WLAN**[25] **Technologies**. These technologies provide connection to Internet through Access Points. The most known is **Wi-Fi**; the term is used to refer to the IEEE 802.11[26] standards. Then there is the highly promoted **Wi-Max** (IEEE 802.16 standards), which has not reached in Europe the same popularity as in the US, Canada and in the Asia-Pacific region.

Fixed and wireless network will converge on a IP-based platform. This phenomenon, worldwide known as **Fixed-Mobile Convergence** (FMC) (Rokkas, et al., 2009), is giving birth to **Integrated Operators**, which have the ownership of both fixed and mobile networks in a market, with clear separation of the fixed and mobile operation's business units. Integrated Operators are able to offer quadruple-play (4P) services.

IP-based platforms enable even further developments as it allows third-party Service Providers and even non-technical end-users to create, manage, share and execute their own personalized services and digital content. Therefore, formerly distinct industry sectors are converging over IP (Ponce de Leon & Adhikari, 2010).

[24] GSM networks work at 900 and 1800 MHz. UMTS utilizes frequencies around the 2100 MHz band. LTE technologies use a wider range of frequencies, as later discussed (see 1.2.7.2).
[25] Wireless Local Area Network
[26] Set of standards created and maintained by the *Institute of Electrical and Electronics Engineers* (*IEEE*, www.ieee.org). The current version of the standard is IEEE 802.11-2007.

1.1.3 Mobile Services

Wireless networks promise **anytime everywhere services**: this is a very strong quality guarantee that Mobile Operators have to be able to provide (Markendahl & Mäkitalo, 2008). Due to the fact that most of the modern devices (see 1.1.4) can have access to both cellular and non-cellular networks, it is often difficult to draw a line between services available on top of these two networks (Smura, Kivi, & Töyli, 2009). Therefore the more generic term **wireless services** should be chosen rather than **mobile services** (which would limit the range of services just to the ones available on top of cellular networks). Anyway, taken into account this theoretical distinction, the two terms are here considered synonyms[27]. From Mobile Operators' perspective, services can be categorized as follows[28]:

- **Voice Services**, traditional phone calls.
- **Data Services**, encompassing:
    - **SMS/MMS**.
    - **Broadband Access Services** to wireless networks (i.e. WLAN, etc.). If the connection is to a cellular network, we talk about **Mobile Broadband Access Services**[29].
    - **VAS:** contents (such as applications, songs, videos, etc.), Advertising[30], payment solutions, etc.

Besides voice services and the simplest data services (SMS/MMS), the common denominator for all the other services is being **IP-centric**. Indeed Broadband access services give access to IP-based wireless network. Contents and Advertising services are available on the top of these networks. Middelton (2010) classifies mobile services as follows:

- **Over-the-top services**: delivered over the Internet, on a *best effort*[31] basis guaranteed by the IP protocol. The simplest OTT services are offered through a web browser (effective for searching, information dissemination, file sharing, accessing audio or video content, and transactions). These services can also be provided using software installed on users' computers.
- **Mobile apps**: self-contained applications for mobile devices (see 3.2.1.2)
- **Managed services**: require enhanced quality and/or security, and are delivered on managed IP networks, for instance with quality of service (QoS) protocols enabled[32]. Examples are: videoconferencing, IPTV, etc.

Mobile services are delivered in two ways (Hammershoj, Sapuppo, & Tadayoni, 2010; Ghezzi, Balocco, & Rangone, 2010):

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[27] This is approach is used by the most of the scholars too (i.e. Ballon, 2009; Ballon & Walravens, 2008; Ballon, Walravens, Spedalieri, & Venezia, 2008; Goncalves, Walravens, & Ballon, 2010).

[28] This classification is based on the work made by *Osservatorio Mobile Content & Internet* (2010) at *Politecnico di Milano* (Italy).

[29] Mobile Broadband Access Service accessed by a mobile phone or Internet key can be named as Mobile Internet too.

[30] Mobile advertisement is set apart for the moment and will be analyzed later (see 6).

[31] In best effort delivery, the network provides no guarantees against packet loss or delivery delays.

[32] These services cannot be delivered over commercial mobile broadband networks (at least not without negotiation with the network operator).

- **Application store**: users access the store, pay for and acquire the application, install it on their smartphone, and use it. This model has been implemented by Mobile Operators (as *TIM* with its *TIM* Store, see 5.1.1.3) as well as by other actors (as Apple with its *App Store*).
- **Browser based** (alternatively named **Mobile Portal**): users access the service through a browser on the mobile device. The service provision is then handled in different ways. Mobile Portals have been usually conceived as integrated solutions with high entry barriers for third parties following the walled garden fashion (see 1.2.1).

In addition to these two delivery systems, **SMS** still have great appeal to distribute contents (i.e. news, weather forecasts, information about bank transactions).

Mobile Operators have experienced the saturation of voice services market (an the subsequent decline of the **Mobile ARPU**[33], Average Revenue Per User) and the explosion of the Internet. These trends are discussed more precisely later (see 1.3). For the moment it is important to point out just that both these phenomena have lead to identify data services and the next growth opportunity for the Industry. (Ballon, 2009). Figure 13 illustrates the most attractive services for end-users[34]: video, games, music, etc.

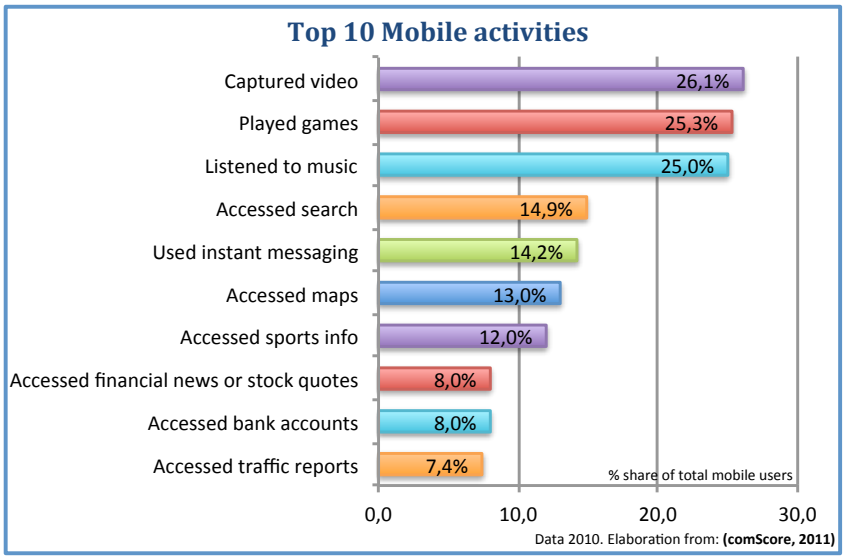

Figure 13 Top 10 mobile activities among the main European countries

[33] ARPU decline has been pushed by the MVNOs too (see 1.2.2).
[34] Users are from the 5 biggest European countries (EU5): Italy, UK, France, Germany and Spain.

1.1.4 Devices

The devices used to access mobile services can be categorized as follows:

- **Feature phones**: devices with limited computing ability, able to support call and additional services (i.e. SMS, MMS, e-mail, etc.). They usually are able to connect just to cellular networks.
- **Smartphones**: mobile phones with embedded computing power and bigger screens. Besides these aspects, another important functionality is connectivity, enabling usually access to both cellular and wireless networks.

  By 2011, smartphone sales are forecasted to exceed all PC sales (mobile and desktop combined), with 400 million shipments (Deloitte, 2010). This estimation is in accordance with data coming from *ABI Research*, which says that 390 million mobile handsets were shipped in Q4, a 15.6 percent increase compared to the same quarter a year ago; *IDC* puts the number at 401.4 million units, at a rise of 17.9 percent; and *Strategic Analytics* says 400 million were shipped, at a rise of 16 percent. (Lunden, 2011a) In a long-term perspective, the number of smartphones is forecasted to reach two billion by 2015 (ITU-R, 2011).

  Smartphone are one of the enabling factors pushing the mobile services explosion. This is confirmed by a research headed by *Wireless Intelligence* (2011c) arguing that smartphones users spend most of their time (667 minutes of face time per month) using applications, only slightly less than the time spent on messaging (671 minutes), and well ahead of both voice calling (531 minutes) and web browsing (422 minutes).
- **Tablets**: complete computers contained entirely in a flat touch screen that uses a stylus, digital pen, or fingertip as the primary input device. They usually enable connectivity to both cellular and wireless networks for gaining access just to data services.

  Tables market is growing really fast, as confirmed by *Strategic Analytics*, which set to near 10 millions the amount of tablets shipped in Q4 of 2010, representing a rise of 120 percent over the quarter before. (Lunden, 2011b) *Gartner* estimates that about 50 millions of tablets will be sold during 2011.
- **Portable computers**: laptops, notebooks and netbooks. They can connect to cellular (through Internet Key and Connect Card) or wireless networks.

1.1.5 End-users

Only consumers (and not business customers) are considered as mobile services **users** (alternatively named **end-users**, **costumers**). Looking at Mobile Broadband Access Services usage, they can be classified in two groups (Markendahl & Mäkitalo, 2008):

- **Complement users**: have broadband access at home and/or work and use the wireless broad band at public places and when on the move;
- **Substitute users**: replace fixed with broadband subscription.

This distinction will be particularly useful later, when discussing about Fixed-to-Mobile substitution (see 1.2.5).

1.2 Current trends

The previous paragraphs are focused on giving a basic understanding about how Mobile Telecommunications industry works. This knowledge constitutes the starting point to investigate industry's most important trends. For the last decade Operators have been progressively opening their closed systems to embrace a more collaborative approach. This trend has implications on the whole value network and therefore it has to be analyzed (1.2.1). One of the consequences of this progressive opening is the diffusion of Virtual Operators' (1.2.2). International alliances are interesting as well, as they constantly reshape markets equilibrium (1.2.3). Another aspect that has been drawing Operators' attention is the convergence between fixed and mobile offerings (1.2.4) that gave birth to Integrated Operators. This trend is coupled with the boom of mobile services that have been progressively substituting fixed services (1.2.5). Operators are involved even in Mobile Payment initiatives (1.2.6). Network technologies are one of the most important areas where Operators focus their expenditures. 4G technologies will dominate the market for the next five – ten years: therefore the main implications have to be understood (1.2.7). To conclude it is also interesting to have an idea about the on-going debate about net neutrality (1.2.8).

1.2.1 From walled to open gardens

Operators introduced the first mobile offerings in the early 1980s. Since then, they have been growing by duplicating network facilities and overlapping coverage areas, due to the absence of a single incumbent providing universal coverage (as in the Fixed industry). The traditional approach was to own and control a network where resources are deployed and operated just by the owner: therefore the ownership of spectrum and the ownership of customers came to constitute the two most crucial assets of traditional Mobile Operators. Moreover, as a response to the shortening of the handset lifecycle, the Operators decided to subsidize handset purchase and to bundle handsets with subscriptions (e.g. through SIM-locks). This increased their leverage as important partners for the Device Providers. At the same time it implied that Mobile Operators were acting not just as Network and Service Providers, but often as Device Providers or subsidizer too. The industry could be characterized as integrated, or at least concentrated, both horizontally (due to limited number of Vendors and Operators in their respective markets) and vertically (due to the fact that the Operators and Vendors were integrating or internalizing activities instead of relying on market competition). (Ballon, 2009)

Scholars[35] describe this traditional Mobile Operators' approach as **closed** (either **walled**) **garden** to point out that the Mobile Operators Industry was characterized by a limited number of innovators, high entry barriers on the supply side and a fairly slow, sequential innovation process (Ballon, Walravens, Spedalieri, & Venezia, 2008). Operators held a prominent position, controlling things from network and applications to services and content (Hammershoj, Sapuppo, & Tadayoni, 2010). There was almost no collaboration with other actors, as shown in Figure 14. This configuration offered a consistent user-experience and made

[35] (Ballon, Walravens, Spedalieri, & Venezia, 2008; Ballon & Walravens, 2008; Ballon, 2009; Goncalves, Walravens, & Ballon, 2010; Goncalves & Ballon, 2011; Ghezzi, Renga, & Cortimiglia, 2009; Feijòo, Gomez-Barroso & Ramos, 2010; de Reuver & Bouwman, 2008; de Reuver, Visser, Guillermo, & Bowman, 2010; de Reuver M., 2011; Shin, 2008; Hammershoj, Sapuppo, & Tadayoni, 2010; Feijòo, Gomez-Barroso, & Ramos, 2010; Holzer & Ondrus, 2011).

billing, security and customer support simple as everything was centralized. From Operators' point of view, walled gardens guaranteed a large share of revenues and reduce the risk to become mere connectivity providers. (de Reuver M. , 2011)

These closed systems have progressively been opening up due to the growing consumer demand for freedom to choose between devices, software applications and networks. It is what some researcher call **Open Mobile** (Deloitte, 2009) or **open garden** (Ballon, Walravens, Spedalieri, & Venezia, 2008).

Assessing the timeframe when walled gardens have been abandoned in favor of more open approaches is not an easy task. The shift is an ongoing process that has implications in multiple domains but further considerations are limited to the domains relevant for this study.

A good hint comes from the work by Murata, Hasegawa, Murakami, Harada, & Kato (2009), who suggest to analyze the problem considering different layers. Elaborating their idea and taking into consideration real-life examples, the following classification is proposed:

- **Network**. Since 1980s Mobile Operators have been developing separate networks. In the last years this trend is changing and Operators are moving towards network sharing. The first example of shared network is dated back to 2000, with *Telia* and *Tele2* in Sweden (*SUNAB*, see 5.2.1). During 2009 *Tele2* and *Telenor* created joint venture (*Net4Mobility*) to build a 4G network and share the spectrum in Sweden (Telenor, 2009). In 2011, the Russian Operator *Yota* is heading a similar initiative (see 1.2.7.1). Irish Operators O_2 and *eircom* are working in this direction too (GSMA, 2011d).

  Telecommunications future will be characterized by Open Heterogeneous Mobile Networks, where resources can be deployed not only by existing operators but also by companies, universities and so on (Murata, Hasegawa, Murakami, Harada, & Kato, 2009).

- **Wholesale market**. Openness in the wholesale market moved its first steps during 1999, where the first Mobile Virtual Network Operator (*Virgin Mobile UK*) began its operations in the UK. The situation varies from country to country as the wholesale market was introduced by the regulatory authorities to drive competition into markets where existing MNOs held significant market power (see 1.2.2).

- **Contents and applications.** Mobile Services platforms are used to develop and deliver mobile services to end-users. Talking about open and closed gardens at this level is more complicated and requires a systematic approach (see 3.2.3.3). Anyway, Operators' mobile portals (see 1.1.3) represent the classical example of closed gardens. The most famous one is *Vodafone live!,* operating since 2003.

  The transition from this paradigm to the application stores (see 1.1.3) began in 2008 (July 10), when *Apple* launched its *App Store*. Every company implements this paradigm in its own way so that we can have open approaches (as the *Android Market Place*, launched by *Google* on October 22, 2008) and models that are less open (as the *App Store*). Therefore the Mobile Services competitive arena (see 3.2.3.1) is currently characterized

by both paradigms. Anyway more recent approaches (as the *WAC* project launched in 2011, see 5.2.3) confirm the trend towards openness.

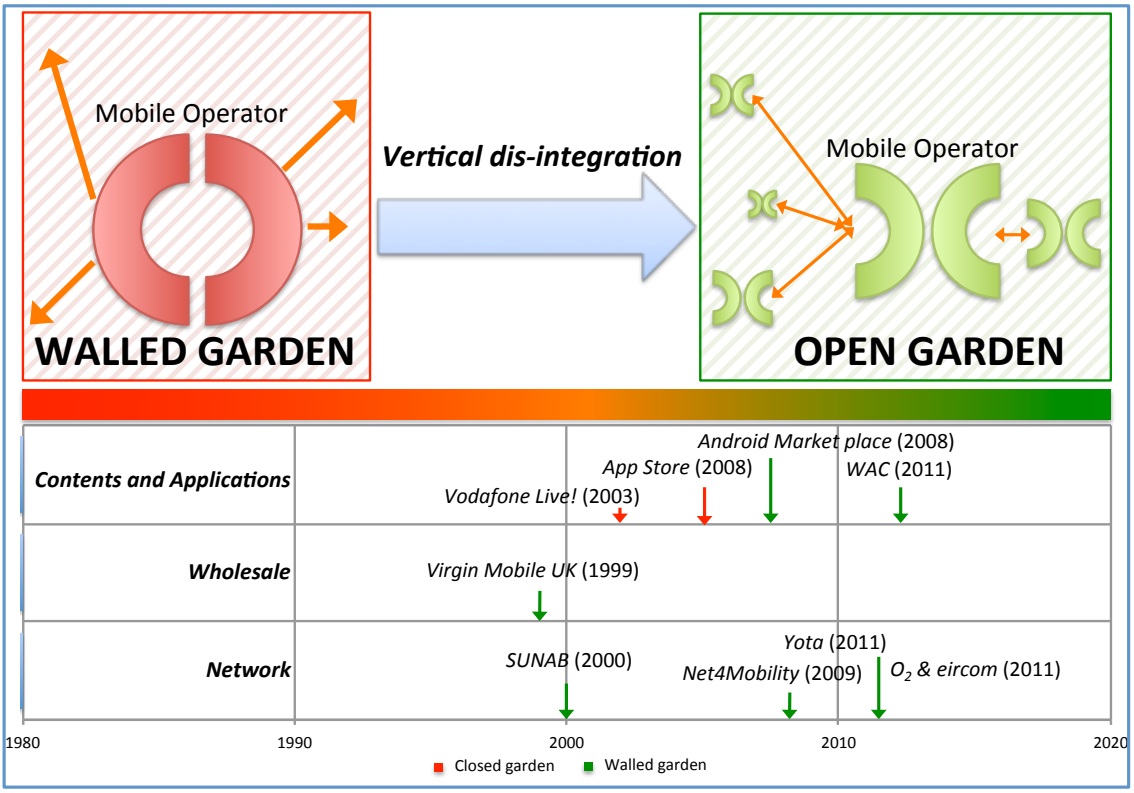

Figure 14 From walled to open garden

Another domain where the open approach is spreading is **Mobile Payment**, as confirmed by initiatives such as *dubbed Isis* and *Pay-Buy-Mobile* (see 1.2.6.2).

Overall, Open Mobile is the result of a **vertical dis-integration** process that has affected Mobile Operators, Service Providers, as well as Device Providers (Cricelli, Grimaldi, & Ghiron, 2010). Operators' role has been reduced leading to a modular configuration, where assets are spread among the actors who have active value exchanges with each other (Figure 14). For example, the introduction of MVNOs (see 1.2.2) has created a situation where many major players separate from the MNOs, seeking to access the value chain at all levels (Shin, 2008). Current industry characteristics can be summarized as follows (Banerjee & Dippon, 2009):

- Multiple competitors;
- Little or no advantage of incumbent;
- Allocation of a critical resource (radio spectrum) through competitive bidding and auctions;
- Provision of broadband and converged services;
- High or rapidly rising market penetration rates;
- Emerging mode of choice for pursuing the goal of universal access;
- Termination access monopoly in countries with calling-party-pays regimes;

- Ubiquitous fixed-to-mobile and mobile-to-mobile interconnection and domestic and international roaming agreements.

1.2.2 The impact of Virtual Operators

Mobile Virtual Network Operators are nowadays a phenomenon of growing importance in the industry. Indeed, since 2000, MVNOs have been taking significant market share, altering industry's value network and increasing churn and subscriber acquisition costs (Shin, 2008). The number of MVNOs is set to globally exceed MNOs by mid-2013 (Wireless Intelligence, 2010b).

Lacking of own licensed spectrum and (usually) of own network infrastructure, MVNOs need to have agreements with MNOs to buy minutes of use and then use the network supplied by MNOs to resell mobile services under their own brand names (Lo, 2009). Effective MVNOs have sufficient agreements with existing Operators to provide a good service coverage area, and some well-diversified MVNOs can offer a product mix that incumbent Mobile Operators cannot match (Banerjee & Dippon, 2009). Moreover, due to the fact that many MVNOs have focused on offering discounted services, the industry has experienced an increased competition and a lowered ARPU.

Considering the target market, SVP Advisors (2010) identifies the following MVNO business models:

- **Ethnic**: targets international communities providing cheap calls to home countries (i.e. *Mobisud* in France).
- **Discount**: simple and cheap mobile services targeting price sensitive customers (i.e *Simyo* in Belgium, Germany, France, The Netherlands and Spain).
- **Retail**: offered by retailers with strong distribution network targeting the mass market (i.e. *Coop Voce* in Italy and *Carrefour Movil* in Spain).
- **Telecom**: mobile services offered to landline customers in addition to existing services (i.e. *Ono* in Spain and *Fastweb* in Italy).
- **Media/Youth**: value added music and video content targeting young people (i.e. *MTV Mobile* in Italy and *Vybemobile* in Germany).
- **Banking**: targets existing customers providing additional services such as mobile banking (i.e. *Poste Mobile* in Italy and *Bankinter* in Spain).
- **Data**: MVNOs that provide only mobile data and broadband access. An example is *BT* in the UK.
- **Business**: targets corporate customers with tailored voice and data solutions (i.e. *Abica* in the UK).
- **Web**: offers innovative services (i.e. call filtering, personalized voicemail and online inbox). An example is *fonYou* in Spain.
- **Advertising**: free calls and SMS subsidized by targeted advertising to subscribers (i.e. *Blyk* in the UK and the Netherlands).

Considering the level of investment and technical independence (Cricelli, Grimaldi, & Ghiron, 2010), MVNOs can be classified as (Lo, 2009):

- **Service provider**: uses MNO's infrastructure, purchasing airtime at a wholesale price for resale to consumers (i.e. *Sainsbury's Mobile* in the UK).
- **Enhanced service provider**: has more branded customer interfaces and usually provide additional services through its service platform. The carrier entirely relies on the MNO (i.e. *Poste Mobile* in Italy).
- **Full MVNO**: borrows irreplaceable mobile communications infrastructures (such as radio transmissions and base station controllers) from MNO. It has its own network and provides its own differentiated services. The MVNO appears as a roaming partner and it needs interconnection arrangements with other Operators (i.e. *Virgin Mobile* in the UK).

These business models model are interesting for both new players and existing MNO (SVP Advisors, 2010). **New players** can use this model to reach mobile users through:

- Simple and cheap tariffs.
- New services.
- Innovative voice and data propositions.
- Cross-promotions (existing activities).

The **existing MNOs** can use this model (as alternative to developing sub-brands) in order to target market segments.

1.2.2.1 Alliances between Host Network Operators and MVNOs

Besides bundling mobile services with other products, MVNOs add value such as **brand appeal**[36] (Lo, 2009), **distribution channels** (Banerjee & Dippon, 2009), and other affinities to the resale of mobile services. In that respect, MVNOs are a cross between resellers and affiliated subsidiaries of HNOs (see 1.1.1). Like resellers, they maintain separate structural identities from their HNOs. However, unlike resellers, even if appearing to compete with their hosts, they actually use their resources to benefit both.

MNOs' advantages are mainly related to (Cricelli, Grimaldi, & Ghiron, 2010):

- **Infrastructure usage**: incomes received by the MVNO for the utilization of the infrastructure as well as operational cost reduction, risk sharing, improvements of the network effectiveness and economies of scale[37].
- **Refine the strategy**: MVNOs offer HNOs the possibility of:
    - **Focusing** on a particular market segments by specializing on a limited set of activities.
    - **Expanding** its traditional market by differentiating its position in the network.

Possible drawbacks for the MNOs encompass:

[36] A better term would be brand value: the financial value of the brand (Kotler & Keller, 2009, p. 158).

[37] Shin (2008) points out that the consequences are similar to the ones of liberalization, privatizations and deregulation.

- **Profit reduction**: not sufficiently differentiated strategies (adopted by MVNOs and MNOs) may lead to struggle for the same subscribers on the basis of retail price.
- **Network congestion**: MVNO's entry may degrade the quality of the network services.

From the MVNOs' point of view, the main opportunity consists in taking advantage from its large pre-existent **customer base**. Nevertheless these players have true weaknesses:

- Lack of experience in the industry;
- Difficulty in competing with the MNOs;
- Uncertainty of the results;
- Risk of high investments on the necessary equipment.

A factor that plays a critical role in the relationship is the wholesale discount level in the resale transaction between MNO and the MVNO (Banerjee & Dippon, 2009).

Taking all these comments into account, two different scenarios for a partnership can be identified (Cricelli, Grimaldi, & Ghiron, 2010):

- **The HNO is the incumbent.** A collaborative strategy is advantageous for both the MVNO and the HNO. Indeed the HNO/MVNO collaboration generates a sort of network externality, where either of them takes advantage of the benefits of the other, to the detriment of other MNOs. Therefore competitive or hostile strategies are not convenient in this scenario.
- **The HNO is a follower.** Network externalities are lower than in the previous situation. The study results show that, in a collaborative relationship, the MVNO gets a slight growth but it is forced to lower retail prices to be able to compete and, as a consequence, its profit diminished; the only advantage for the HNO is to lower the market share of other MNOs. Therefore neither of them prefers to collaborate as they find evident advantages in a different relationship. The MVNO prefers a competitive relationship, while the HNO prefers an aggressive relationship.

Therefore we can conclude that the MVNO prefers to enter the market in a collaborative relationship with the HNO when the latter is the incumbent, due to the fact that such a relationship succeeds in getting a better performance for both of them at the same time (Cricelli, Grimaldi, & Ghiron, 2010). Such a **voluntary** relationship can exist only if the MVNO adds value to that relationship in ways that mere resellers cannot, such as by widening and/or deepening the MNO-served market (Banerjee & Dippon, 2009).

1.2.2.2 A European phenomenon

Europe is the homeland of the MVNOs, due to the fact that it hosts about 57% of the about 700 Virtual Operators currently present in the global market (Wireless Intelligence, 2010b; 2011a).

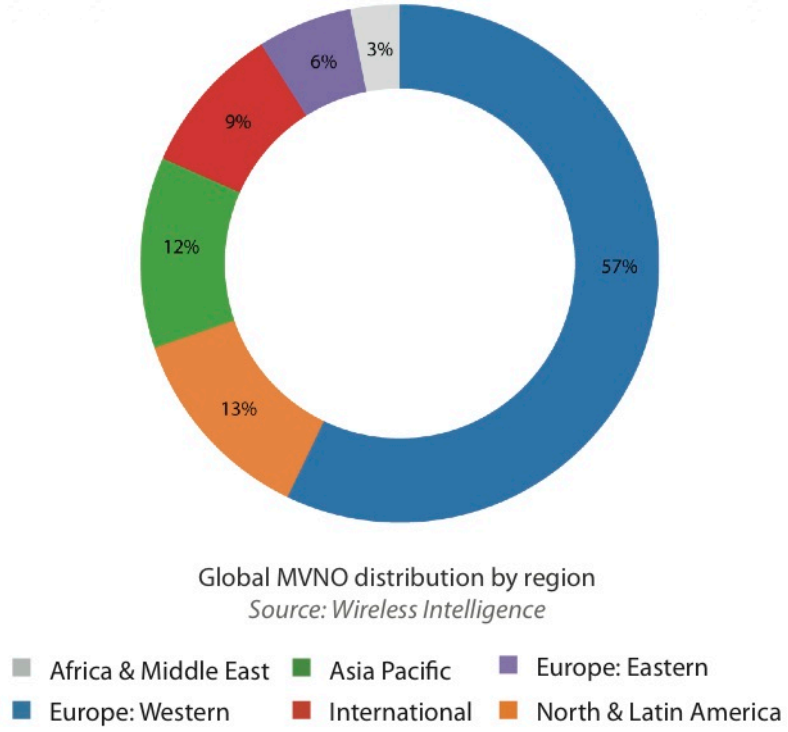

Figure 15 Global MVNO distribution by region. (Wireless Intelligence, 2011a)

The European market has been experiencing a continuous evolution. The current trends encompass that (SVP Advisors, 2010):

- In mature MVNO markets (e.g. Northern Europe), mass market generic MVNOs are losing ground to niche MVNOs targeting specific segments or offering innovative services and solutions.
- Several MNOs are becoming increasingly active in the MVNO market by:
    - Buying MVNOs hosted in their network.
    - Launching sub-brands.
- As mobile markets approach maturity and regulation promotes competition, MVNOs are expected to appear in many new countries.

MVNOs are a country-specific phenomenon: the number of players and their market share vary a lot from country to country. A research by Wireless Intelligence (2010b) shows that German market is the most interesting one in the EU due to that fact that:

- It hosts the biggest amount of MVNOs. Such a proliferation has been developed partly in response to the market segmentation approach adopted by *E-Plus* together with their keenness to attract MVNOs to their network. In addition to 15 brands of its own, *E-Plus* hosts 38 MVNOs. E-Plus' approach prompted the other Operators to follow suit in launching their

own operator-owned brands and reach MVNO agreements and is a major factor in Germany having the second-lowest ARPU in Western Europe.

- It is dominated by a handful of large MVNO groups such as *Freenet* and *Drillisch Telecom*. As of Q1 2010, *Freenet Group* alone accounted for 17.2 million connections or 16% of the German market.

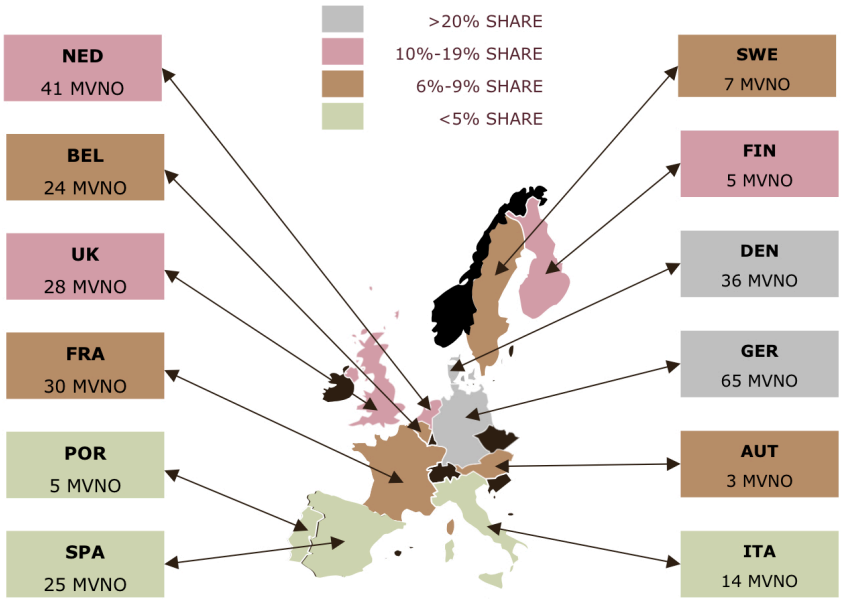

Figure 16 MVNOs presence in Europe (SVP Advisors, 2010)

1.2.3 International alliances

The major European Mobile Operators (*Vodafone*, *Telefonica*, etc.) have been developing international alliance inside and outside the EU. These foreign investments may result from the combined interaction of environmental forces of policy and technology and various strategic factors. Whan-Seon, Myeongho, & Kyung-Don (2009) identify the following causes driving and enabling the internationalization strategies of Mobile Operators:

- **Regulatory environment**: shifts in environmental forces, such as deregulation, privatization and liberalization[38].
- **Growth concerns**: Operators have often incentives to invest abroad in order to avoid the fiercely competitive situation in their domestic markets.
- **Economic gains**: Mobile Operators with bigger networks can utilize economies of scale when constructing networks and managing traffic and can realize enhanced buying power[39].
- **First mover pre-emption**: early movers gain substantial first-mover advantages due to the transient nature of the windows of market opportunity and the potential to influence the regulatory process as an incumbent. In the mobile industry this is even more important due to:
    - **Spectrum limitations**, the may restrict the number of players;
    - **Regulation**, governments might allow very limited entry to foreign Operators.
- **Systemic ownership advantages**: an international presence is valuable because external stakeholders (i.e. financial institutions) assign increasing salience to market capitalization and it enhances Operator's influence over institutions, such as ITU (International Telecommunications Union).

Four kinds of international strategies[40] are identified:

- **Establishing an international presence**: Mobile Operators aim to expand their own market internationally, trying to obtain major stakes by investing in foreign Mobile Operators. The overall generated revenues are reflected in their consolidated financial statements.
- **Creating business synergies**: aiming to reach economies of scale, this approach requires Mobile Operators' active involvement in the business operations. Some forms of implementation might be:
    - Joint procurement of network equipment or handsets;
    - International branding strategy;
    - Strategic alliances for roaming services.

[38] An example is *T-Mobile*'s investment in Poland, where the company owns 93% of *PTC*.
[39] Both *Telefonica* and *Vodafone* achieve benefits through better management of volumes across Europe and greater efficiency in logistics. (Whan-Seon, Myeongho, & Kyung-Don, 2009)
[40] The first two categories require more involvement than the third and the fourth categories. Therefore a Mobile Operator that fulfills the requirements of the first two strategic categories can possibly fulfill those of the third and fourth at the same time.

- **Generating revenues through exporting**: Mobile Operators export services (i.e. consultancy) or technologies (mostly proprietary), which have been proven to be competitive in the domestic markets, to foreign markets. The objective is to generate additional revenues by utilizing existing competencies.
- **Earning capital gains**: Mobile Operators act as financial investors with the goal to increase the amount of non-operating profit.

All the above-mentioned strategies are likely to imply equity participation, which can be classified in four categories:

- **Over 50%**: full management control over the investee.
- **Under 50% and the largest shareholder**: not full but still considerable management control.
- **Under 50% and not the largest shareholder**: limited control.
- **No Equity**: no control over the partner.

1.2.4 Fixed-Mobile Convergence

The Telecommunications Industry is experiencing a convergence towards platform network architecture (see 1.1.2). Encompassing a broader meaning, convergence is occurring at different levels (Rokkas, et al., 2009):

- Content/services.
- Transport/software.
- Equipment/hardware.

Although these levels are interrelated, convergence at the content or service level does not require convergence at the transport level (network convergence) and network convergence does not necessarily imply convergence of services.

In its most general meaning, convergence has been driven by (Rokkas, et al., 2009):

- **Industry drivers**: cost savings (by eliminating redundancies and harmonizing the network and service management), faster time-to-market (by having the ability to provision new and advanced services over multiple end-user devices simultaneously) and the ability to retain customers' loyalty (by making access to services easy and simple).
- **Technology drivers**: progress in standardization and implementation of enabling technology platforms (such as *IMS*, see 3.2.3) and availability of a growing number of multi-radio handsets.
- **Market drivers**: summarized as follows:
    - Customer demand for ubiquitous access of advanced content and services.
    - Single authentication, authorization and accounting (AAA) capabilities.
    - Ease of use.

FMC implies adopting an IP-centric **platform network architecture** for both wired and wireless access networks. Such architecture brings the following competitive advantages to the Integrated Operators (Rokkas, et al., 2009):

- **Cost Savings.** After introducing FMC, cost savings (in terms of OPEX) are experienced by the Integrated Operator. OPEX can be divided as follows:
    - **Network related elements**: network operation, OSS operation, maintenance and repair of the network elements, equipment and software licenses, rental of network resources, costs for site rental and electricity.
    - **Marketing and sales related elements**: sales and marketing activities, customer acquisition and subsidization**.**
    - **Customer service related elements**: customer care, charging, billing, call center.
    - **IT, support and service development related elements**: service management, design and development of new services, Business IT, management support, costs regarding the purchase of licenses for content delivery.
    - **Interconnection and roaming costs**: termination fees for calling or completing a call or a session originated or terminated in another network.
- **Market share retaining**. This has a wider impact on profitability compared to cost savings and also enables the reduction of revenue erosion from existing services by introducing packages with FMC services.

End-users benefit from FMC too, finding response the need of accessing the same wide portfolio of services irrespective of the type of device and access. These services must therefore be user-centric and not be dependent upon the network infrastructure (Bang, et al., 2009). All these benefits come at a cost in terms of **Technical efficiency** due to (Lehr & Chapin, 2010):

- **Overheads,** required for sharing a common network among multiple applications. While IP header overhead is small for most services, it becomes significant for services that require frequent transmission of short packets, notably two-way voice calls.
- Inability to apply **application-specific optimizations**[41], at the lower layers of the network.
- Problems arising from **IP characteristics.** IP provides only *best-effort* packet delivery. Resource management to balance offered load to available capacity, and recovery from packet loss, are handled at a higher level by Transport Control Protocol (TCP). This design has proven immensely valuable for the Internet, enabling it to integrate a wide range of network technologies that have different loss and delay characteristics. While this simple approach is effective and efficient for non-real-time services, newer

[41] Such optimizations include physical layer broadcast for broadcast services, error protection and recovery mechanisms tuned to the specific needs of different applications, and resource allocation mechanisms that exploit the latency tolerance of data-oriented applications (Lehr & Chapin, 2010).

multimedia services (i.e. VoIP) have challenged this model requiring Quality of Service (QoS) approaches**,** which imply overheads. Overheads are well tolerated by high capacity wired networks but may create problem with limited capacity wireless networks.

Besides the technical aspects, other risks are related to the following aspects (Rokkas, et al., 2009):

- **Cannibalization** effects when new services are introduced to the market.
- **Slow migration** might give an advantage to competing service offerings, with result the loss of market shares.
- **Uncertainty** about the next paradigms in network architectures and service platforms increases the likelihood of wrong decisions.
- **Large investments** are required therefore careful and systematic assessment is required too to avoid costly consequences.

1.2.5 Fixed-to-Mobile Substitution

While FMC involves the Operators, **Fixed-to-Mobile Substitution** (FMS) revolves around end-users: these two phenomena represent two sides of the same trend.

FMS means the replacement of fixed-line services with mobile services or the use of mobile instead of fixed phone for calls or access to telecom services. It does not necessarily mean substitution in the technical sense of positive cross-price elasticity of demand. Therefore it is not necessarily a shift in demand in response to a change in the relative prices of the two services. Austria is the European country that, starting from 2002, has been experiencing FMS the most. This trend is driven by the following aspects encompassing demand (**Substitute users**, see 1.1.5) and supply perspectives (Vogelsang, 2010):

- Fixed network subscriptions and telephone usage decline, while mobile network user numbers and usage increase.
- **Mobile and fixed services are perceived as substitutes**. On the demand side, this is true at least for making calls; the access services are different as mobile services may attract premium customers due to their mobility component that fixed services cannot have, while fixed services have, until now, enjoyed high speed Internet capacity which also influences demand for access. On the supply side, they are complements in transport because connections between cells is done over the fixed network.
- Price decline of mobile against fixed services.
- Network effects, quality improvements and an increased scope of services have all benefited mobile networks.

1.2.6 Mobile payment & Operators

With the term Mobile Payment is identified as a process in which at least one phase of the transaction is conducted using a mobile device (see 1.1.4) capable of securely processing a financial transaction over a mobile network, or via various wireless technologies such as Bluetooth, RFID[42], NFC[43] (Ghezzi, Balocco, Renga, & Pescetto, 2010).

Within this domain, Mobile Operators' focus is to support the core business of **Merchants** (the ones selling Mobile Payment services directly to end-users) and **Service Providers** (''technology enablers'' of the offer supplying the technology infrastructure) and their relation to end-users (Smith, Markendahl, & Andersson, 2010; Ghezzi, Balocco, Renga, & Pescetto, 2010).

1.2.6.1 The Trusted Element.

Mobile Payment systems need a **Trusted Element**[44] (TE): functional unit (that can exist alone or in a device) that allows the storage and exchange of data in such a way that makes a secure transaction possible. This means guaranteeing (Smith, Markendahl, & Andersson, 2010):

- **Data exclusivity**, accomplished by restricting the ability to read, write or process data that exists in the TE to a limited number of actors.
- **Platform exclusivity**: how a TE allows the information terminal (i.e. the mobile phone/smartphone) to use it and especially how many TEs can exist simultaneously in the information terminal. Having multiple TEs can be achieved by adopting multiple SIM cards or hardware that can support several simultaneous secure connections or through virtualization using software.
- **Device interoperability**: the ability of the TE to be used in a number of different information terminals without the need to redesign or customize the TE. This is possible if the TE has its own dedicated hardware and/or software.

TEs can be implemented as follows (Smith, Markendahl, & Andersson, 2010):

- **SIM cards**[45]**.** SIM cards provide excellent data exclusivity as only Mobile Operators have the keys to access and modify what is contained in the card. Indeed they have exclusive access to both the contents of the TE as well as the platform the TE is installed in. Moreover they guarantee optimal device interoperability.

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[42] Radio-frequency identification (RFID) is radio waves technology to exchange data between a reader and an electronic tag attached to an object, for the purpose of identification and tracking.

[43] Near Field Communication (NFC) is a short-range wireless communication technology standard that enables the exchange of data between devices over up to a 10 cm distance.

[44] Alternatively: Security Element (SE).

[45] The actual implementation is done with a Universal Integrated Circuit Card (**UICC**). This (physical) smart card holds several (logical) applications, among which the most known are: SIM (Subscriber Identification Module, needed to have access to GSM networks), USIM (Universal Subscriber Identification Module, needed to have access to UMTS/HSPA/LTE networks), contact storage, etc. A TE can be stored in a UICC.

This kind of solutions implies Third Parties playing intermediary roles. First, when it comes to services provisioning, a **Trusted Third Party** (TTP) is needed if many Operators are involved (No TTP is needed if all the customers are connected to a single Operator). Second a **Trusted Service Manager** (TSM) is needed to deal with agreements with many Merchants/Service Providers so that each Mobile Operator does not need to have own agreements with them.

- **Module in standard interface.** The module may be a micro SD card that acts as the TE. Moreover some software has to be added to the phone. Major credit card companies have presented solutions of this kind. Mobile Operators can have totally different roles, and they might not even be involved in this kind of initiatives.
- **Custom chip installed in the device.** Although there are no examples of this solution, it can be realized in the form of user installable hardware in a standardized package format or separate chip that is directly installed into the mobile device during manufacture. Accessing the data in the TE is not exclusive to a single entity: indeed TE resources could be shared among Merchants by provisioning the applications to use part of the storage and computing resources available in the TE. Moreover the platform is not necessarily exclusive to a single TE: indeed multiple TEs could be plugged in, or installed in the mobile device. Interoperability is excellent too as the TE does not share part with the mobile device.
- **Software-based (virtual).** The number of virtual TEs a device can support is only limited by the available memory and computing resources. Due to hardware and software fragmentation (see 6.4), interoperability is a concern. Because there is no shared TE, no TTP is needed.

1.2.6.2 Different implementations of the Trusted Element

Looking at the different approaches to realize mobile payment systems, two are the most important aspects: proximity (whether the transaction is done close to a point of sales terminal or not) and whether the security and/or payment solution will be directly connected with the SIM card or with a server or the mobile phone itself. Therefore, mobile payment solutions can be categorized as follows (Smith, Markendahl, & Andersson, 2010):

- **SMS payment**. Mobile subscriptions are used for identification and charging but do not include any proximity features. The SIM card is used as TE. Between the Mobile Operators and the Service Providers that want to user their SMS services, there are often the so-called **Aggregators**: they aggregate SMS traffic from all the Operators. These last two actors have an agreement on the price for specific amounts of SMS traffic and, if the mobile phone subscription is used to pay, the size of Operator' service fee. Therefore Mobile Operators' biggest issues are about:
    - **Size of the transaction fee.** Operators typically keep 20-30% of a SMS transaction when an Aggregator is used for distribution of payments.
    - **Limit on SMS transactions**, which prevents use of more expensive tickets, i.e. for concerts, train travels and airline flights.

- **Separate charging solutions:** users to order and pay with the mobile phone without charging of the phone subscription. The identification is based on the mobile phone number and the charging is based on use of a credit card or sending an invoice to a billing address. The services have no proximity features.

To group together these two solutions and to stress the absence of proximity, the term **Mobile Remote Payment** (Osservatorio NFC & Mobile Payment, 2010) can be used. **Mobile Proximity Payment** (Osservatorio NFC & Mobile Payment, 2010) is used to identify the following solutions:

- **NFC phones.** Users can store credit cards, loyalty cards and access cards as an application running in the phone. Identity and security is handled by the TE that could be realized in many different ways: SIM card, etc. The proximity feature is given by the device (i.e. mobile phones, smartphones), which has to touch or be moved across an infrastructure device such as a reader in a shop.

  52 Mobile Operators (within the *Pay-Buy-Mobile* initiative, headed by *GSMA*) support this approach. The Device Manufacturers are willing to massively adopt NFC too: *Samsung* is an early pioneer; *Nokia*'s smartphones to be released during 2011 will support NFC; *RIM* will adopt it with many phones; some rumors involve *Apple* too (Wireless Intelligence, 2011a).

- **Other contactless mobile payments methods.** Proximity can be achieved in different ways, such as NFC and RFId stickers or Bluetooth connection. The main advantage is that there is no need for NFC phones and the solution may be Operator independent as they may be involved neither in storing/managing the payment application nor in the end-users' transactions. Anyway Operator may have still some room by focusing just on offering the service to the customers through their network infrastructure while other partners handle they payments and credits as, for example, in the US where *Verizon Wireless*, *AT&T* and *T-Mobile USA* are participating in the venture (*dubbed Isis*) to develop a shared network using NFC technologies (Cheng & Morrison, 2010; Wireless Intelligence, 2011a; Smith, Markendahl, & Andersson, 2010).

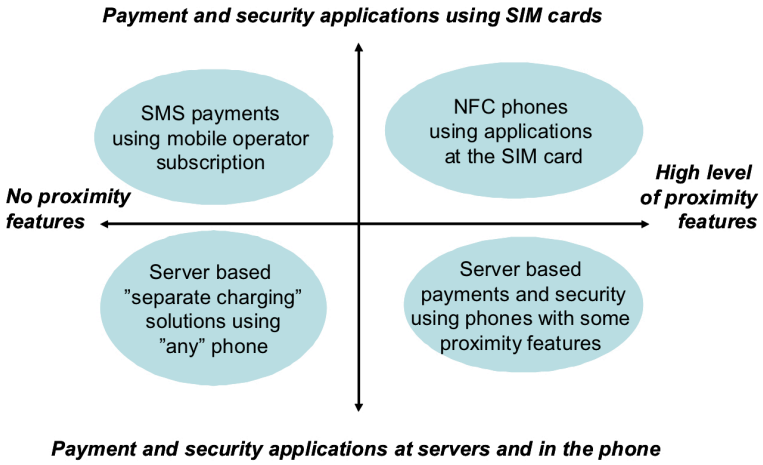

Figure 17 Grouping of mobile payment solutions. (Smith, Markendahl, & Andersson, 2010)

1.2.6.3 European Directives

The European Commission adopted two directives crucial for Mobile Payment initiatives:

- **Payment Service Directive (PSD)** [46]**.** It ensures that the rules on electronic payments are the same within the EU27 countries. Moreover it allows new payment institutions (i.e. money remitters, retailers, Operators) to provide payment services alongside banks. Member States have adopted the national rules implementing the Payment Services Directive into domestic law during 2009 - 2010.
- **e-Money Directive (EMD)** [47]**.** This directive focuses on modernizing EU rules on electronic money, especially bringing the prudential regime for electronic money institutions, into line with the requirements for payment institutions in the PSD. Member States have to adopt it by April 2011.

1.2.6.4 Challenges for Mobile Operators

Analyzing all these different approaches, it emerges that Mobile Operators' biggest assets are SIM cards (allowing optimal interoperability) and SMS services (limits on transactions may exist). These assets represent Operators' strength, which is undermined by new solutions for implementing TEs (see 1.2.6.2). Indeed these new solutions may even exclude Operators from the Mobile Payment arena, as some of them are Operator-independent. An example is *VISA*'s solutions for *iPhone* (VISA, 2011).

Abstracting from the specific example, Financial Institutions (mostly card issuers[48] and banks[49]) play a pivotal role in this domain. Their biggest assets are their electronic payment systems and, most importantly, their brand. The latter is crucial because it is strictly connected with people's perception of transaction safety. Smith, Markendahl, & Andersson (2010) point out that intermediary actors (such as TTP, TSM and Aggregators) take most of the roles. Moreover these roles are closely linked and often one actor takes many roles for a specific service. As a result, the others (Financial Institution and Operators) are "less directly involved".

Mobile Operators are anyway not willing to desist; on the contrary they trying to react with initiatives aimed at keeping Operators at the center of the value network (Wireless Intelligence, 2011a). They are joining forces to cooperate with their competitors in order to provide a common solution, as in the *dubbed Isis* venture in the US and the *Pay-Buy-Mobile* initiative.

[46] 2007/64/EC.
[47] 2009/110/EC.
[48] Such as *Mastercard* and *American Express* and Financial Institutions issuing VISA cards.
[49] Acting as card acquirer.

1.2.7 4G: the new technological challenge

Network congestion is set to worsen (ITU-R, 2011). This is confirmed by *Ericsson*'s forecasts are set to 50 billions mobile connections by 2020, generating up to 1000 times the current network traffic (Wireless Intelligence, 2011a).

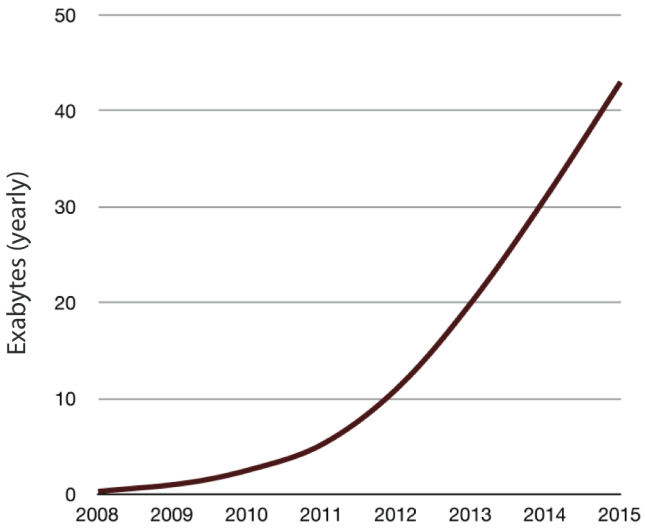

Figure 18 Mobile data traffic volumes. (Wireless Intelligence, 2011a)

Mobile Operators have to deal with the impact of rapidly **growing data volumes** on network performance and how they should best manage this growth. For this reason 4G technologies, which represent the next generation of broadband wireless access communication systems (Bajaj, Babbar, Chawla, & Malhotra, 2009), have a great impact in Mobile Operators' strategic decision for next years.

Septermber 2008

- *Sprint Nextel* begin using WiMAX wireless networks in Baltimore (MD, USA), branding them as 4G

October 2008

- ITU-R defines the requirements for 4G (IMT-Advanced) networks

September 2009

- Candidates (6 in total) for IMT-Advanced are submitted to ITU-R to be evaluated.

October 2009

- ITU-R start the evaluation process of the six proposals received

December 2009

- *TeliaSonera* launches the first commercial 4G service in Stockholm (Sweden) and Oslo (Norway)

October 2010

- ITU approves LTE-Advanced and WirelessMAN-Advanced as 4G technologies

Figure 19 Path toward 4G: the most important steps.

Defining 4G has been a long process headed by the International Telecommunication Union's Radiocommunication Sector (ITU-R). Among the various events (Figure 19), two were the milestones:

- **Define the requirements**: among them, the target peak data rate was set to 100 Mbit/s for high and 1 Gbit/s for low mobility. The bandwidth had to be scalable up to and including 40 MHz (ITU-R, 2008).
- **Qualify the technologies**: two technologies, LTE-Advanced and WirelessMAN-Advanced, are qualified as true 4G (IMT-Advanced) technologies (ITU-R, 2010). These technologies provide a global platform on which to build the next-generations of interactive mobile services that will provide faster data access, enhanced roaming capabilities, unified messaging and broadband multimedia.

Therefore 4G encompasses several types of broadband wireless access communication systems (not only cellular telephone systems) that have the IP layer as common denominator. We can therefore talk about 4G as an IP-centric architecture that can be shortly described as **MAGIC** (Bajaj, Babbar, Chawla, & Malhotra, 2009):

- Mobile multimedia
- Anytime anywhere
- Global mobility support
- Integrated wireless solution
- Customized personal service

Reviewing the works by Bajaj, Babbar, Chawla, & Malhotra (2009), Gobjuka (2009), Di & Huanhuan (2009), Khan, Qadeer, Ansari, & Waheed (2009), Arshad, Farooq, & Shah (2010) 4G's main features can be summarized as follows:

- **High performances**: due to higher bandwidth (up to 40MHz) and higher data rate (100 Mbit/s – 1 Gbit/s).
- **Interoperability and easy roaming**: seamless access guarantees to user connectivity to different access technologies and access network with minimal input from the user.
- **Scalability**: 4G adopts an horizontal IP-centric architecture that ideally suits this challenge.
- **Fully converged services**: flexible and intelligence technology to make a wide variety of services available to the different platforms supporting 4G.
- **Enhanced Location-Based services**: push and pull services relying on the network's ability to locate subscribers.

The main challenges introduced by 4G refer to the following areas:

- **Personalization**: support of personal context-user profiling, context awareness, AAA (authentication, authorization, accounting), open third party access, adaptability, etc.

- **Quality of service**: higher performances must be coupled with enhanced quality, effective security measures and extensive alternatives to reach the contents without delays.
- **Integrating services**: non IP-based devices (such as the ones used for VoIP services) and IP-based devices are both served by 4G. Therefore integrating mechanisms of providing services are needed.
- **Dealing with a complex architecture**: complexity is introduced by:
    - **Multimode devices**: devices that operate on 4G networks have the capability to operate in different networks. A mechanism to adapt the device to various wireless interfaces has to be implemented.
    - **System discovery and selection**.
    - **Service and billing**.

Mobile Operators alternative adoption strategies are (Telecompaper, 2011a):

- **4G networks parallel to existing 3G networks**. The former can be used for new services with high requirements of speed and quality such as Video-on-Demand and HDTV.
- **Fixed Broadband Wireless Access** (FBWA). This approach is suitable for countries where a broadband fixed network infrastructure does not exist or is not economically feasible (i.e. India and Russia).
- **4G to expand the capacity of existing wireless networks**. This approach is recommended for situations where the large numbers of smartphones and tablets cause capacity problems for Mobile Operators (i.e. as experienced by *AT&T* after the introduction of *iPhone*).

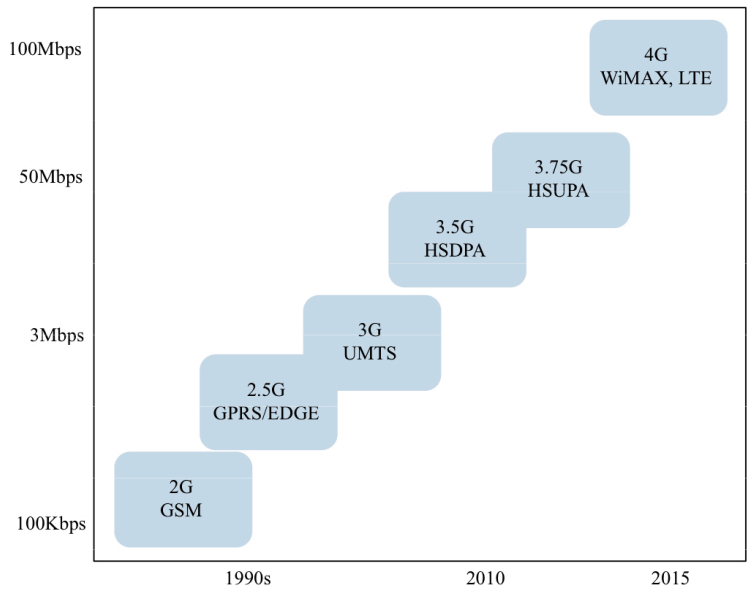

Figure 20 Path to 4G. (Akan & Edemen, 2010)

As stated before, LTE and WirelessMAN (WiMAX) represent wireless network technologies future: their last developments (LTE-Advanced and WirelessMAN-Advanced) are the only ones to have been qualified as true 4G. Due to their importance, more specific observations are needed.

1.2.7.1 An overview on LTE standards

LTE-Advanced (3GPP Release 10) represents one of the cellular networks more recent technologies. It has been developed and standardized the 3rd Generation Partnership Project (3GPP) as a major enhancement of the 3GPP Long Term Evolution (LTE) standard (3GPP Release 8). It is the natural evolution of several 2G and 3G systems, including GSM and UMTS (Figure 20). This aspect does not imply that current 2G/3G networks can be adapted to LTE: using OFDM-SCFDMA instead of WCDMA, implementing LTE requires building new networks.

In September 2009, 3GPP submitted LTE-Advanced to ITU-R be evaluated as a candidate for IMT-Advanced (3GPP, 2009). This standard is supported by many operators (such as *Vodafone*, *Orange*, *T- Mobile*, *NTT DoCoMo*, *China Mobile* and *Telecom Italia*) and vendors (such as *Ericsson*, *Nortel*, *Alcatel-Lucent*, *Nokia Siemens* and *LG Electronics*) adhering to the LTE/SAE Trial Initiative (LTSI).

Globally, LTE technologies (regardless the specific release) are expected to explode in 2011, when Mobile Operators are going to spend about $1 billion for LTE equipment; LTE base stations are forecasted to climb to 600,000 worldwide by 2015 (ABI Research, 2010) when about 4% of global mobile connections will be represented by LTE (Wireless Intelligence, 2011a). This trend is confirmed by *Ericsson* that expects to generate significant sales of LTE network equipment from 2012 onwards driven by the surge in mobile data traffic (Sandstrom, 2011).

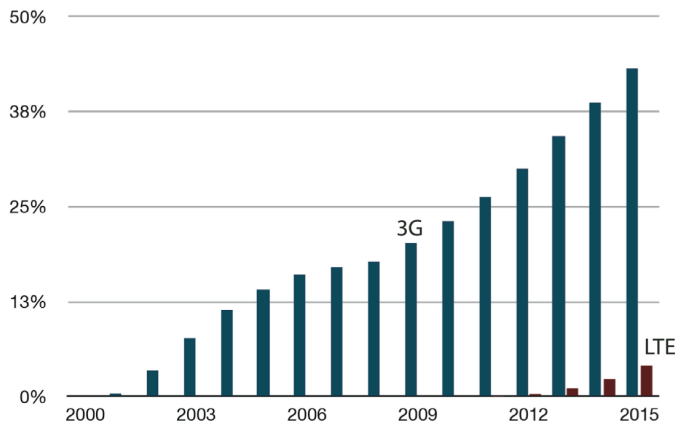

Figure 21 Global mobile connections, technology share. (Wireless Intelligence, 2011a)

A Mobile Operator (currently using GSM/3G for mobile services) that wants to deploy a LTE network is expected to invest about 500 millions EUR (IDATE, 2011). This estimation is detailed as follows:

- **LTE-based access network:** about 335 millions EUR in the period 2011 – 2018. This amount allows to cover a land where live about 10 millions people and to guarantee a population coverage of 75%.
- **Spectrum:** about 80 millions EUR.
- **Backhaul network:** about 112 millions EUR.

Europe has been the world's first commercial area for LTE-based offerings. The Nordics are the area where Operators are experimenting the most. In December 2009, *TeliaSonera* launched the first 4G commercial services based on the LTE standard in Stockholm, Sweden, and Oslo, Norway (TeliaSonera, 2009). This

service has been marketed as 4G even if the actual IMT-Advanced technologies were not defined yet: LTE standard (Release 8) has been used instead of LTE-Advanced (Release 10). *TeliaSonera* extended its 4G LTE-based network to Denmark (May 2010), Finland (November 2010), Estonia (December 2010). From December 2010, *TeliaSonera*'s rivals (*Tele2* and *Telenor*) kicked off a shared LTE network in Sweden that is now experiencing a real competition among LTE-based offerings. Looking at current offerings by *TeliaSonera* and its rivals, what is marketed as 4G is actually based on **pre-4G**[50] (Khan, Qadeer, Ansari, & Waheed, 2009) technologies. Customer adoption has been really low: six months after the commercial launch there were just about 1000 subscribers (PTS, 2011).

In Germany, Telekom Deutschland is rolling out its 4G network and plans to have 1,500 LTE base stations across the country by end-2011 (Telecompaper, 2011c).

In Russia, the Operator *Yota* aims to switch from WiMAX to LTE in the vast majority of its markets by the end of 2013 (Wireless Intelligence, 2010a). To achieve this goal, the Operator has signed a network-sharing deal with the other main Mobile Operators: *MegaFon*, *Rostelecom* and *VimpelCom*. *Yota* will build a network enabling high-speed mobile broadband access services across 180 cities (with a total population of more than 70 million citizens) by 2014 (GSMA, 2011c).

38 LTE networks are currently being planned across Asia Pacific. LTE connections in Asia Pacific are forecasted to exceed 120 million by 2015, spearheaded by China. *China Mobile* is currently testing 4G technologies in the seven biggest Chinese cities and it is ready to invest 20 billions $ in LTE technologies.

In Japan *NTT Docomo* launched its LTE service (branded Xi) in December 2010. In addition *SoftBank Mobile* and *EMOBILE* are both planning on launching LTE services in 2011 and 2012 respectively, expanding their HSPA+ networks in the meantime, while *SingTel* is currently trialing LTE in four markets as part of a plan to establish a "regionally compatible LTE network" across its Asia Pacific footprint.

In the US, *Verizon Wireless* and *AT&T* are the most active players when it comes to LTE networks (Taylor, 2011). *Verizon* estimates to cover at least 147 US cities with LTE technology by the end of 2011. Nevertheless it was *Sprint Nextel* that first launched commercial services branded as 4G in September 2008 in Baltimore (MD, USA) (Sprint Nextel, 2008). The Operator used WiMAX networks[51] but even in this case we cannot talk about true 4G because the implemented version (IEE 802.16e) does not fulfill the IMT-Advanced requirements (WiMAX-Advanced, IEEE 802.16m) set by ITU-R. The Operator will announce its long term 4G strategy by mid 2011 and could chose to switch from WiMAX to LTE (Taylor, 2011).

At the moment, just Internet keys can use LTE-based data services. Capable phones are to be available at the end of 2011.

[50] The term 3.9G is used too.

[51] WirelessMAN is a wireless broadband standard developed by IEEE. It is one of the last evolutions among the 802.16 family of standards, broadly commercialized as WiMAX. Even WiMAX is forecasted to grow consistently: if WiMAX carriers swing behind 802.16m, the number of base stations could surpass 69,000 in 2015; irrespective of the support given to 802.16m, 802.16e Operators are expected to add 90,000 base stations by 2015 (ABI Research, 2010).

1.2.7.2 Spectrum allocation in Europe

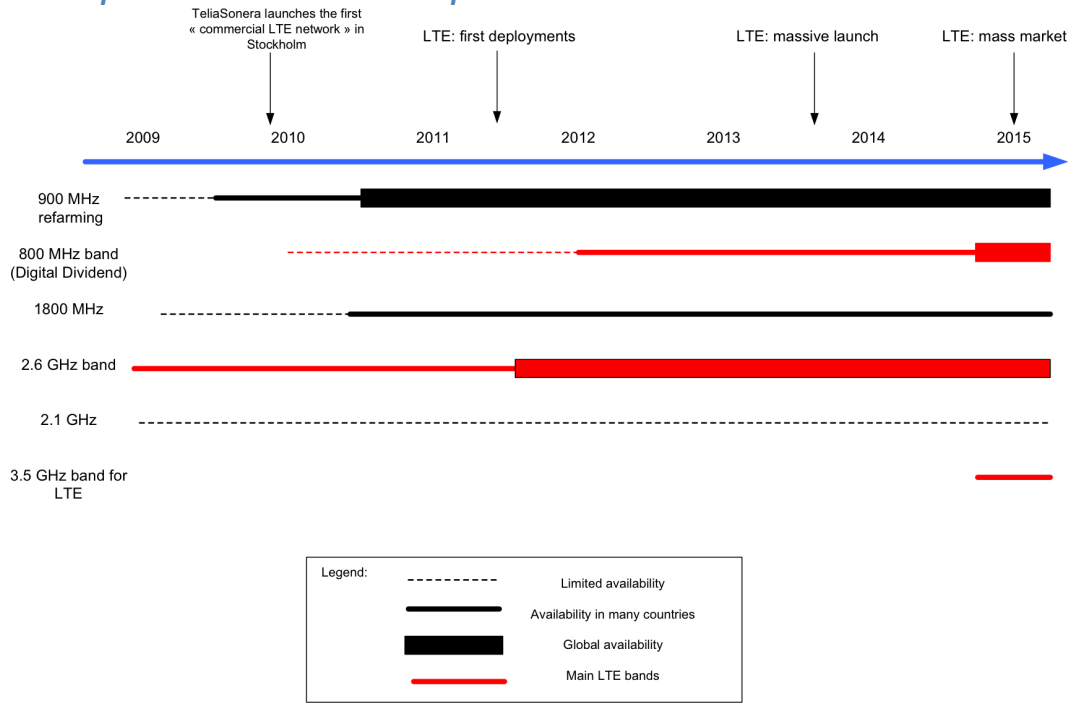

Figure 22 4G bands (IDATE, 2011)

Spectrum allocation will determine the timing and pattern of deployment of 4G services (Ofcom, 2010). Indeed both the EU and the US are facing spectrum constraints. Regulatory and policy-making bodies are working to make more spectrum available for mobile services. The European Commission adopted two directives (2009/114/CE and 2009/766/CE) to make **900** and **1800 MHz** bands available for 3G/4G services. The former is subject to re-farming and spectrum arrangements between Operators. Anyway harmonization in spectrum policy is complicated as spectrum management is competence of the Member States.

2.6 GHz and **800 MHz** bands are expected to be the most widely used in Europe for 4G deployments (Figure 22). These bands are being auctioned and expected prices are 2.6 GHz spectrum to be in the range of EUR 0.01-0.3 per MHz per pop and for the 800 MHz spectrum in the EUR 0.2-1 per MHz per pop range. The latter is expected to be more expensive due to the fact that frequencies around 800 MHz allow have better coverage and, therefore, fewer base stations are needed. These characteristics make the 800 MHz bands more suitable for rural areas.

In the long term, **3.4-3.8 GHz** bands will become available for mobile applications and could be used in cities to provide very high data rates. (IDATE, 2011)

Summer 2010 Germany auctioned off 4G spectrum (800 MHz and 2,6 GHz) for the first time in Europe. The Swedish 4G network works at 2.6 GHz (see 5.2.1.2) and the auction for 800 and 900 MHz bands during March 2011 (Telecompaper, 2011b). UK's communications regulator *Ofcom* expects its 4G auction to take place some time in the first quarter of 2012 with frequencies (800MHz and 2,6 GHz) released by the end of the following year (Parker, 2011c). Spain is expected to authorize auctions that free up additional 4G spectrum by the end of 2011. (Sandstrom, 2010) In these countries LTE-based commercial offerings are expected to take place during 2012 (IDATE, 2011).

1.2.8 Debate on Net neutrality

The term **Net neutrality** (NN) indicates the principle that all web traffic should be treated equally. This topic is nowadays the subject of a huge debate in the Mobile Telecommunications industry [52]. Therefore, it is important to give some clarifications about it. This paragraph does not aim at covering the topic exhaustively but just at giving some information about the problem and at understanding possible consequences for Mobile Operators.

The mobile data traffic explosion (see 1.2.7) pushed by the increasing usage of "bandwidth-hungry" mobile services has led Mobile Operators to step up a campaign to charge internet content providers (often called **Over-the-top, OTT**: providers offering services over a data connection, see 1.1.3) such as *Google* that are unleashing this explosion of data traffic on Operators´ networks. Indeed Operators are spending billions of euros (i.e. *TIM* is to invest about 9 billions per year in 2011 – 2013, see 5.1.1.2) to upgrade their networks to cope with the rapid growth in data traffic and Service Providers are the ones generating most of this traffic without paying for it[53]. *Google*'s *YouTube* is the perfect example of one of these services.

Operators' plans are at the center of the debate about net neutrality. Two are the opposite coalitions: from one side Operators willing the protect the profitability[54] of their investments and, on the other sides, supporters of the net neutrality concept (and, of course, the Over-the-top) saying all web traffic should be treated equally, and complain that Operators' traffic management practices flout their much-cherished principles turning Internet from a democracy to a plutocracy, where rich sites run faster than poor ones. Anyway NN is not just about OTT, it's also about a technology switch: existing services (video/TV, voice/SMS) that no longer necessarily need to make use of a dedicated networked (as a managed service), but can also be offered over an IP data connection (see 1.1.3).

This debate has a global scope. While in the US regulators proposed net neutrality rules that might enable operators to charge providers (December 2011), in Europe regulators are to launch the first pan-European investigation into Operators' controversial data traffic management practices, in an attempt to safeguard NN. They will scrutinize whether Operators (fixed and mobile) are giving consumers enough information about their traffic management policies, which can slow down customers' Internet connections. The European Commission accepts some traffic management is necessary to avoid congestion on Operators' networks but, at the same time, wants to:

- Investigate how and why some Mobile Operators blocking their customers from using VoIP applications (such as *Skype*) on their handsets as these low-cost VoIP services threaten to reduce Operators' revenues (as later discussed, see 6.4).

[52] The debate has implication not only in the Mobile segment but in the whole Telecommunications industry. Nevertheless, according to the main focus of thesis, just the consequences for the mobile segment are here investigated.

[53] According to a recent research, American Operators have a ROCE (Return on Capital Employed) of about 10%, while Service Providers exceed 50% (ITesperesso.it, 2011).

[54] European Mobile Operators commissioned a research from AT Kearney on the topic, which argued that if operators upgraded their networks to meet forecast demand to 2014 without any extra revenue, their returns on capital would fall by 3 percentage points to about 9 per cent.

- Ensure that Operators are not slowing down data traffic in an anti-competitive manner.

Particularly interesting is to note that in June 2011 the Dutch parliament voted to regulate the prices charged by Operators for Internet services, while all governments would like to see those same Operators investing more in broadband networks.

Keeping the Operator-centric perspective that characterizes this investigation, it is interesting to look at the possible financial impact that this debate can have on Mobile Operators. OTT affects both revenues and costs at Operators, and at the same time there's both a positive and negative impact. This results in four possible combinations (Telecompaper, 2011d):

- **Higher sales**. Subscribers need a data connection for OTT services. Operators profit from this as they sell broadband subscriptions (fixed or mobile). Even more important, without the OTT sector, the entire broadband market would be worth much less. Indeed without the mobile services offered by *Facebook*, *Google*, *Apple*, etc., an old-fashioned narrowband connection would be more than enough to satisfy consumers needs.
- **Lower sales**. The new OTT services often compete with managed services (see 1.1.3) from Operators. This is the key bone of contention in the entire NN debate. However supporters of NN, which point to the importance of innovation, do have examples of certain services or protocols being blocked.
- **Higher costs**. Extra data traffic leads to higher network costs. While traffic is growing exponentially, revenues are not keeping up, mainly due to operators selling flat-fee subscriptions. The assumption behind this is that costs are growing just as fast as data traffic, but that is highly questionable. The problem is the flat-fee subscription, but there's nothing stopping Operators, if needed, from increasing the cost with tiered pricing, based on speed or data allowances.
- **Lower costs**. When subscribers use more OTT services, use of managed services declines, as do the related network costs. Furthermore, new opportunities are emerging by working with OTT providers. *Skype* is a good example, as it brings with it a large customer base and the associated network effect. The Operator can also profit from the use of a (cheap) international network and *Skype*'s technology.

Overall Operators have to keep in mind that OTT providers have turned the broadband market into an enormous opportunity for Operators. They might be a threat but they can turn out to be an opportunity too. Indeed if Operators know how to work with OTT players there are even more profits in reach, as both parties, Operator and OTT Provider, complement each other, while the end-user also profits. Cooperation is the way chosen by Operators as *Telefonica* (that has acquired *Tuenti*, a Spanish social network that has started an international expansion and *Jajah,* a VoIP provider) and *France Telecom* (that has acquired stakes in *Dailymotion*, the "French *YouTube*" and *Deezer* a streaming music service similar to *Spotify*).

1.3 Summing up: main challenges for Mobile Operators

In the Open Mobile era, Mobile Operators' role in the value network is threatened. They are exposed to the risk of loosing control over the value created on their infrastructure and seeing reduced to mere access providers (Ballon & Walravens, 2008). They are under pressure for the following reasons:

- **Profits are threatened**. As mentioned before (see 1.1.3), **revenues** from voice services (volume-based priced) are in serious decline. A new study by *Wireless Intelligence* (2011b) reveals that mobile ARPU across the 27 European Union (EU27) countries has fallen by 20% over the last three years, dropping from EUR 25 in 2007 to EUR 20 in 2010 on average. This fall (Werding, 2010) has been caused primarily by ongoing declines in the average per-minute price for voice calls, which dropped from EUR 0.16 to EUR 0.14 in the EU27 mobile markets over the period. Revenue growth from non-voice services has helped to stabilize ARPUs but is not yet fully compensating for falling voice revenue. Non-voice revenue (including messaging) rose by just EUR 1 on average over the last three years to around EUR 6. Within this, mobile data ARPU has doubled to just under EUR 3 but still accounts for less than 15% of total ARPU. Moreover a research by *Deloitte* (2010) points out that charging premium fees for data services could not be possible anymore in the imminent future.

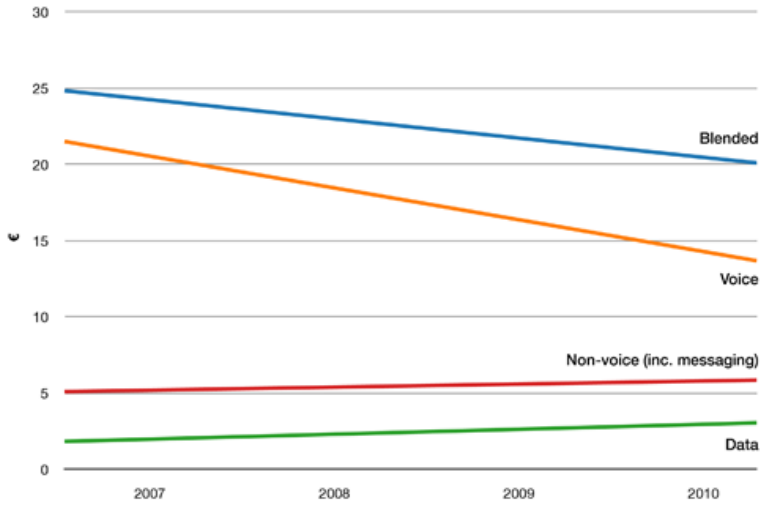

Figure 23 ARPU 2007 – 2010. (Wireless Intelligence, 2011b)

This situation is complicated by the massive 4G-related investments (spectrum and network equipment) needed to deal with the problem of network congestion (see 1.2.7), driven by the increasing diffusion of smartphones and other "data-hungry" devices (see 1.1.4). Besides these **expenditures** (aimed to increase network throughput), *ABI Research* (2011) estimates a 4.2% year-on-year expenditures increase for mobile gateways, subscriber databases, IMS, session border controllers, and software switch/media gateways in 2011. This trend confirms Operators' will to make their networks more efficient and aware of the traffic passing through them.

- **The relation with end-users may be compromised.** In the Open Mobile era Operators no longer own and control a network where resources are

deployed and operated just by the themselves. The value network is now more balanced, assuming a modular configuration where assets are spread among the actors (see 1.2.1). This undermines Operators' relation with end-users, due to the following aspects:

- **Potential threat of no longer controlling devices.** Consumers may wish purchase devices through retail channels that are independent of the Mobile Operators' influence. If/when this occurs, carriers will have to quickly adapt despite their fears of a changing profit mix (Deloitte, 2010). An additional threat is fueled by the rumors around *Apple*'s idea to develop its own SIM card for its devices (Parker, 2010; Lunden, 2010a). Moreover *Apple* might act as MVNO too as it seems it has indeed been discussing a purchase of massive data volumes from a European company (Ahlbom, 2011).
- **Value is shifting to other services.** The role of voice and broadband access services providers is not satisfactory anymore for the Mobile Operators. These services are more and more perceived as commodities so that, for example, O_2 (UK second largest Mobile Operator, owned by *Telefonica*) decided to give free access over its Wi-Fi network (Parker, 2011a).

The current situation pushes Mobile Operators to take some initiative. Besides aiming to manage Mobile Services in a more efficient way (Deloitte, 2010), they are looking for new sources of revenues (Ballon, 2009). This objective can be achieved following two alternative strategies (Figure 24):

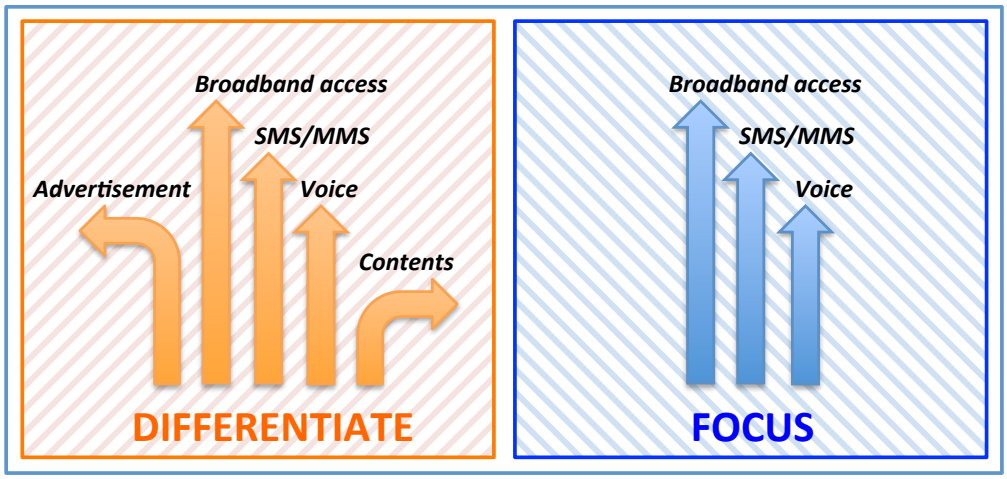

Figure 24 Two alternative mobile services strategies

- **Focus** on "core" services such as voice, SMS/MMS and broadband access. This approach is based on viewing connection to customers as a "**dumb pipe**", where Operators are envisaged as connectivity providers (Peppard & Rylander, 2006). An example is *Tele2* in Sweden. Mobile Operators may take different initiatives to increase their revenues while focusing just on their "core" services. One possible way is to charge premium fees for 4G broadband access services. As discussed before, this is a growing area (mobile data ARPU doubled in the last three years) for the Operators, but still accounts for small part of their revenues (just 15% of the total ARPU). Operators are working in this direction, introducing even new 3G rate plans

characterized by higher monthly caps and higher downlink data rates. Further details are analyzed later (see 2.1). Another possible initiative is to **charge Service Providers** (i.e. *Google* for *YouTube*) for guaranteeing high-quality delivery of their services (Parker, 2011b; 2011d). Operators claim these services to be the main reason of data explosion (see 1.2.7) and they are willing to stop Providers' "free lunch". Operators' idea is technically feasible but, at the same time, controversial because it goes against the **net neutrality** principle (see 1.2.8).

- **Differentiate** the offering, encompassing contents and advertisement too. Operators have to act as **smart pipe**" in order to protect their privileged position on the value network and remaining relevant. This entails brokering out their key assets such as search, personalization, device management and sophisticated charging to Service Providers. (Peppard & Rylander, 2006). This strategy is not new and Mobile Operators have been following it for the last decade adopting, for example, the Mobile Portal model (see 1.1.3, 1.2.1). This approach is now out-of-date and Mobile Operators are currently confronted with limitations seeking ways to attract larger constituencies by adopting a more open approach (Ballon, Walravens, Spedalieri, & Venezia, 2008). The current trend towards openness is among the reasons platforms developed by players such as *Apple* (with the *App Store*), *Google* (with *Android*) and *Facebook* are currently attracting both a large number of users and Service Providers (Goncalves, Walravens, & Ballon, 2010). Even the giant *Amazon* has recently announced its platform, fully compatible with *Android* (Lunden, 2011e). The application store paradigm represents the new challenge for Operators (see 1.1.3, 1.2.1).

Both these strategies (focus and differentiate) would be worthy to be further investigated but it is crucial to have a more limited approach to continue this work in an effective way. Having to choose among on these approaches, investigating which can be the strategies Operators can use to differentiate their offerings is much more interesting because it has deep implications in the entire industry configuration. More specifically it is extremely interesting to discuss how Mobile Services platforms (i.e. Mobile Portals and Application Stores) can be good way to retain some control over the customers (and the value network in general). This scenario erases the following questions that will guide the investigation from now on:

In the Open Mobile era, how can Mobile Operators defend their position in the value network? How can platforms play a strategic role to achieve this objective?

To answer these questions in a systematic way the most effective way is to develop a value network model for the Mobile Services domain that has Mobile Services platforms at its core.

2 The Italian Mobile Telecommunications industry

Italy, one of the most mature markets for Mobile Telecommunications, is here analyzed following the same analytical framework used before (see 1): first the structural configuration is explored (2.1); then current trends are highlighted (2.2). Main findings are summarized in the final paragraph (2.3).

The approach is more data-oriented and charts play a main role. These data are enriched with contributions coming from interviews with all the four Italian Mobile Network Operators (see 5.1).

The Italian context is often compared with the other main European countries: United Kingdom (UK), France (FRA), Germany (GER) and Spain (ESP). To group them all together the term EU5 is used too. Sweden (SWE) is taken into account too as, despite being smaller (in terms of population) than the others, it can be considered as a model for the Telecommunications Industry. Indeed this country has always been an innovator (i.e. GSM and most recently with 4G) and therefore it is interesting to keep it into consideration to make some benchmarks.

2.1 Structural configuration

The Italian Mobile Telecommunications industry is one of the most advanced in Europe as it has the highest penetration rate (1,52), 3G connections (56,6 [55]) and mobile broadband connections (6,8 [55]) among the EU5 countries.

	ITA	UK	FRA	GER	ESP	SWE
Penetration rate	1,52	1,29	0,95	1,31	1,17	1,33
3G connections [55]	56,6	41,0	23,8	31,6	49,8	60,5
Mobile broadband connections [55]	6,8	4,1	3,2	1,6	4,2	14,4

Data 2009. Elaboration on data from: **(Ofcom, 2010)**

Table 2 Market maturity: comparison among the main European countries

2.1.1 Mobile Operators

Four are the Mobile Operators competing in Italy (more information about them can be found later, see 5.1). Their market share is represented in the table below [56].

Operator	Mobile Services	Voice Services	Data services
TIM	39,3%	39,8%	38,0%
Vodafone	36,8%	36,5%	37,6%
Wind	15,9%	18,6%	13,5%
H3G (Tre)	6,4%	5,1%	11,0%

Data 2009. Source: **(AGCOM, 2010)**

Table 3 Italian Mobile Operators

Italian Operators have overall been experiencing revenues contraction during 2009 (-2,9%): despite revenues from data services have increased (+1,7%), it was not enough to compensate a drop in voice services revenues (-4,4%).

[55] Per 100 inhabitants.

[56] Mobile Services are divided into voice and data services as discussed before (see 1.1.3). MVNOs have been excluded.

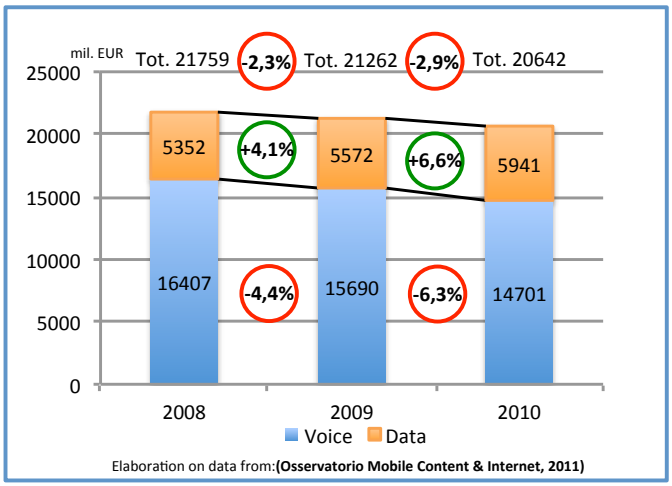

Figure 25 Mobile Operators' revenues

This trend is aligned with what has happened in most of the European Countries, where revenues from data services have been increasing while the ones from voice services have been reducing. Italy has overall performed a better than Spain (-4,8% on the total revenues), UK (-3,2%) and Germany (-3,1%) but worse than France (+0,1%) and Sweden (+1,9%). (Ofcom, 2010)

2.1.2 3G Network Technologies: the present

Looking at Network technologies, Italian Operators use UMTS/HSDPA networks. These networks support speeds up to 14,4 Megabit/s and cover up to 90% of the population, as shown in Table 4. To improve the data rate, Operators are running projects to update their network. Two are the main technological paradigms: HSPA+ (currently being implemented and here analyzed) and LTE (planned for next years, see 2.2.6).

Operator	Mobile Services
TIM	85%
Vodafone	85%
Wind	83,7%
H3G (Tre)	90%

Updated on 31/12/2010. Source: **Operators**

Table 4 UMTS/HSDPA population coverage

HSPA+ networks are able to guarantee data rate up to 43,2 Megabit/s. The used bands are 900 and 2100[57] Mhz. More information about Operators' network investments can be found the case studies (see 5.1).

2.1.3 Mobile services

The maturity of the Italian market is confirmed also by the fact that Italians are the heaviest social network users on a global scale: indeed 66% of the population uses social networks (Guadagnuolo, 2011a). This is just an indicator but it remarks how mobile services in general (not only voice and data services) have been drawing the attention of the Italian market.

[57] All Operators own licenses to operate their networks at 2100 Mhz.

Indeed mobile services usage has been increasing during 2010. Besides a sensible increase in voice (+10,9%) and SMS[58] (+14,4%), data services have experienced a real boom: +81,4%. This boom is aligned with what is happening globally (see 1.1.3).

Usage	2009[59]	2010[60]	Trend
Voice services (mil. of minutes)	82.095	89.282	+10,9%
Data services (traffic in terabyte)	45.494	82.518	+81,4%
SMS services (mil.)	54.171	61.983	+14,4%
Expenditures			
Voice services (bill. EUR)	11,04	10,92	-1,1%
Data services (bill. EUR)	4,17	4,21	+9,6%
SMS services [61] (bill. EUR)	2,37	2,22	-6,33%

Elaboration on data from: **(AGCOM, 2011)**

Table 5 Mobile Services usage in Italy

Despite this boom, end-users' expenditures for data services have increased just by 9,6% while voice and SMS services have dropped. The overall expenditures trend during 2010[62] is -3,6% (AGCOM, 2011).

It is interesting to analyze how mobile ARPU has evolved during the last years in the main European countries. Figure 26 shows how mobile ARPU has changed from 2004 to 2009. Besides Sweden (+8%) and Spain (≈0%), the overall trend shows a contraction in mobile ARPU. Germany is the country where this contraction has been more noticeable (-41%), followed by Italy (-21%). These values are anyway in accordance with the general trend among the EU27 countries, where the ARPU has decreased by 20% over the last three years reaching an average of EUR 20 (see 1.3).

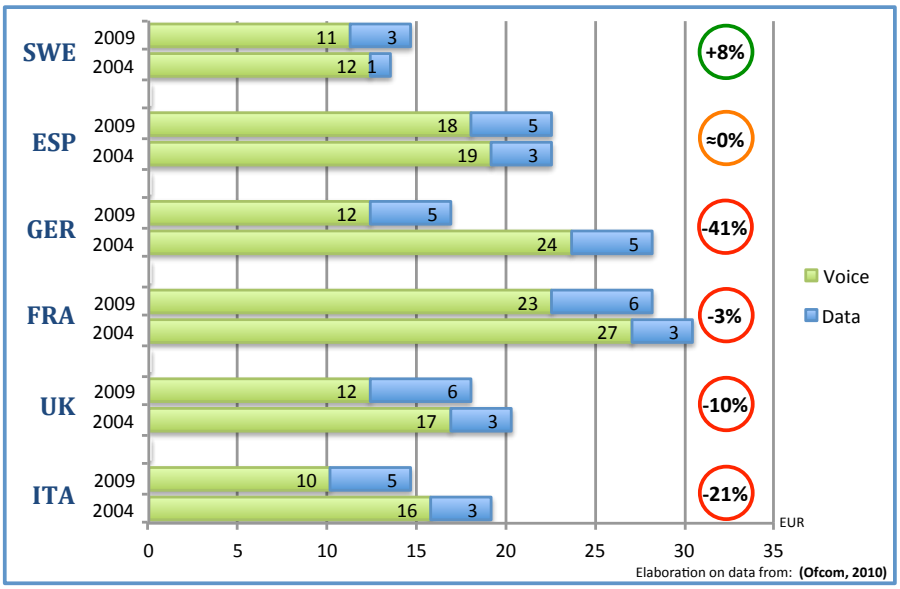

Figure 26 Mobile ARPU: comparison among the main European countries

[58] Differently from before (see 1.1.3), data and SMS services are split.
[59] 1Q-3Q 2009.
[60] 1Q-3Q 2010.
[61] SMS services expenditures are part of data services expenditures
[62] Confirming the trend during 2009 (-3,5%).

Coupling together mobile ARPU (Figure 26) and penetration rate (Table 2), further observations can be done. As shown in Figure 27, it emerges a correlate (at the least for the selected countries) between ARPU and penetration rate: countries with lower ARPU have higher penetration rate (i.e. Italy). On the contrary, countries with higher ARPU (i.e. Spain and France) have lower penetration rate. Sweden is the exception in accordance with what observed until now.

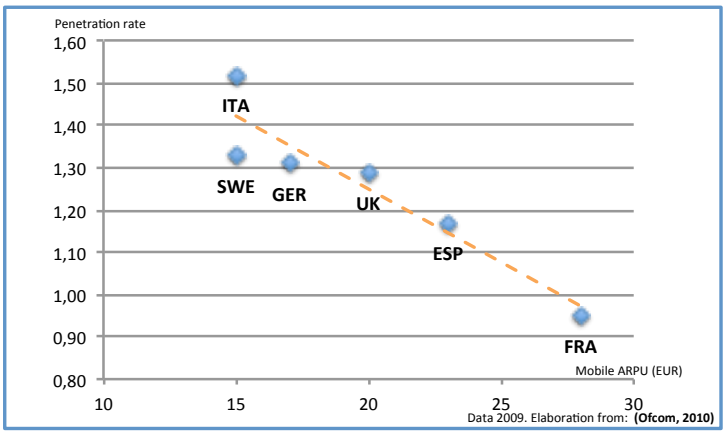

Figure 27 Penetration rate and mobile ARPU: comparison among the main European countries

2.1.4 Devices

Smartphones diffusion has exploded in Italy during 2010. Currently there are about 17 millions smartphones making Italy the second EU5 country for smartphone penetration (35%) in a chart led by Spain (37,6%) (comScore, 2011). **Tablets** are expected to follow a trend similar to smartphones: about 1,5 million devices are forecasted to be sold in Italy during 2011 (Olivetti, 2011).

Internet Keys are preforming well too. Being the first Operator to adopt unlimited data price plans (see 2.1.5), *Wind* has obtained outstanding performances in the last months jumping from 8% (June 2010) to 22% (February 2011). *Tre* has performed well too, passing from 15% (June 2010) to 19% (February 2011). On the contrary *Vodafone* has registered a remarkable contraction (from 35% to 23%), performing worse than *TIM* (from 36% to 33%) (Lavezzari, 2011).

2.1.5 End-users and price plans

Most of end-users are consumers (88% of the active SIM cards) and "pay as you go" price plans are still the most common ones (84%), as shown in Figure 28. To cope with this market peculiarity and deal with the growing data usage (see 2.1.3) Operators are working to create **new data price plans** for end-users, as referred in the case studies (see 5.1).

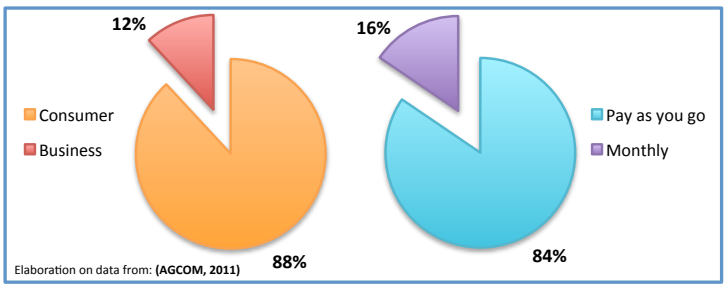

Figure 28 Active SIM cards in Italy: consumer vs. business costumers and prepaid vs. flat fees

2.2 Current trends

This section analyses the most important dynamic variables in the Italian Mobile Telecommunications industry, following the same pattern used in the previous chapter (see 1).

2.2.1 From walled to open garden

As discussed before (see 1.2.1), real-life open garden examples involve network infrastructures, wholesale market, mobile payment collaborations and mobile services platforms. Besides the wholesale market initiatives (Virtual Operators, see 2.2.2) that have found fertile ground in Italy since 2007, an interesting initiative is headed by Mobile Operators in the mobile payment domain (see 2.2.5). Moreover it is important to point out that *Telecom Italia* and *Vodafone* are among the Operators supporting the *Wholesale Application Community* (see 5.2.3).

2.2.2 The impact of MVNOs: new challenges in the Industry

In 2007 the first Italian Virtual Operators began their business. Since then their number has been increasing until reaching eighteen units during 2010. The boom (+78%) was between 2008 and 2009, where seven new Operators were launched.

MVNO	HNO	Year
50&PiùNet	Tre	2009
A-Mobile	Wind	2008
BT Mobile	Vodafone	2007
CoopVoce	Tim	2007
Daily Telecom Mobile	Vodafone	2008
Digitel Italia	Tre	2008
Enelmia	Wind	2009
ERG Mobile	Vodafone	2009
Fastweb	Tre	2008
Lycamobile	Tre	2009
MTV Mobile	Tim	2009
Noverca	Tim	2009
PosteMobile	Vodafone	2007
Tiscali Mobile	Tim	2009
UNO Mobile	Vodafone	2007
ZeroMobile	Tim	2008
HopTel	Vodafone	2010
Digi Mobil	Tre	2010

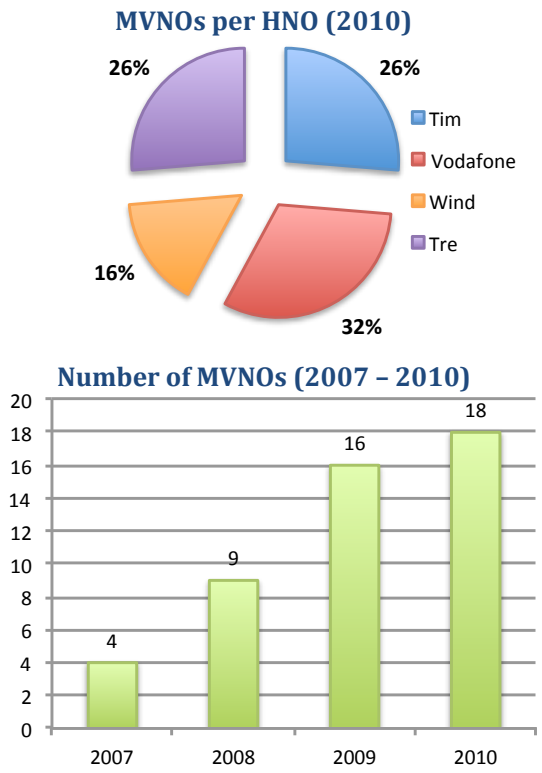

Figure 29 Italian MVNOs and HNOs

The main consequence of this boom is the explosion (+73%) of MVNO subscribers that reached 3,385 millions units during 2010[60], representing 4% of the entire mobile market[63]. During 2010 just two new Operators were launched therefore a more modest subscribers increase may be expected during 2011.

[63] Calculated considering the number of active SIM cards (89,880 mil.).

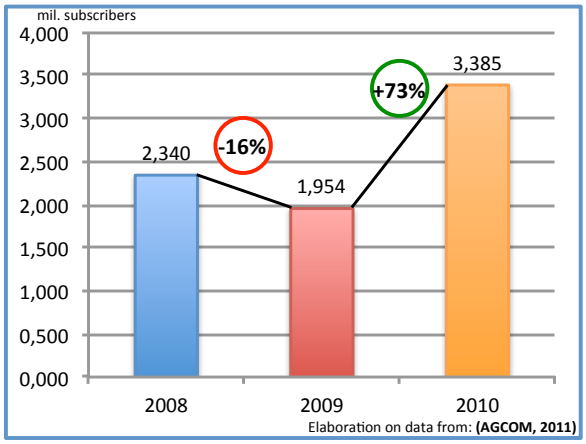

Figure 30 MVNO subscribers in Italy

Looking at alliances between MVNOs and HNOs in the wholesale market, *Vodafone* is the Operators hosting more MVNOs. *Tre* plays a really interesting role in this market: despite being the smallest Mobile Operator (Table 3), it has alliances with about 26% of the MVNOs (the same amount as *TIM*, the market leader).

Among MVNO business models (see 1.2.2), four are particularly relevant for the Italian market (AGCOM, 2010):

- **Ethnic**: Operators such as *Daily Telecom* tailor their offerings for Asiatic consumers (mainly from China and the Philippines) currently living in the country. This business model attracts about 9% of the MVNO subscribers and it is based on a price competition for international voice services that are offered as commodities. Revenues are modest, representing 8% of the total (Figure 31).
- **Retail**: *UNO Mobile* (*Carrefour*), *CoopVoce* and *ERG Mobile* well exemplify this model, chosen by 26% of the subscribers. Despite its popularity, it generates only 15% of the total revenues due to the fact that these mobile services are often used to promote retailers' traditional products (whose revenues represent retailers' biggest interest).
- **Banking**: *Noverca* and *Poste Mobile* are good examples of Operators offering advanced mobile banking services. This model is the most attracting because it has been gaining more and more appeal among consumers (51% of the total subscribers) and it generates most of the revenues (63%).
- **Telecom**: This model well represents Operators' FMC strategies (see 2.2.4). *Tiscali Mobile* and *Fastweb,* for example, strengthen their position in the Telecommunications market by offering mobile services in addition to fixed services that have represented their core business.

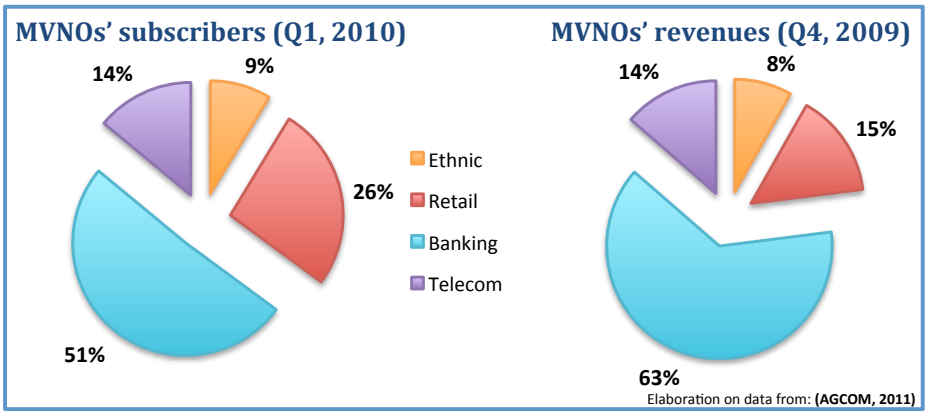

Figure 31 Classification of business models: subscribers and revenues.

As mentioned before, existing MNOs can use MVNO model as alternative to developing sub-brands in order to target market segments. In the Italian market a good example comes from *MTV Mobile* owned by *TIM*. The *MTV* brand appeal is used to target young users by offering appealing mobile contents such as music, video, etc.

Being a highly country-specific phenomenon, making comparisons with the other European countries is not easy. With the data gathered before (see 1.2.2.2), Italy's role can be analyzed using the following variables:

- **Virtual Operators' market share.** Italy and Spain show a really low market share (<5%). France and UK have intermediate positions in the chart headed by Germany, where more than 20% of the subscribers choose a MVNO.
- **Number of Operators.** Italy has the lowest number of players (16) while Spain (25), UK (28) and France (30) are some steps ahead. Germany (65) dominates the chart.

2.2.3 International alliances

Some interesting **M&A operations** have involved Italia Operators during the last year. *Telecom Italia* (the Telecommunications group behind the mobile brand *TIM*) has been really active refining the synergies with *Telefonica*, its main shareholder. The group has strengthened its presence in Argentina taking control of 58% of *Sofora*, the holding behind *Telecom Argentina* (Sideri, 2010). Moreover the group has abandoned Cuba by selling its share of *ETECSA* (Telecom Italia, 2011a; Telecom Italia, 2011b).

Being part of the world largest Telecommunications group, the Italian branch of *Vodafone* attains to the group's strategy that aims disinvesting in the French market by selling 44% of *SFR*, the second Mobile Operator in the country (Parker, 2011d).

Wind is one of the Telecommunications companies involved in the fusion between *VimpelCom* and *Weather*. This operation (in which is involved even *Telenor*, which owns 40% of *VimpelCom*) will give birth to the fifth biggest Mobile Operator on a global scale. (Wind, 2010; Fi., 2011)

2.2.4 Fixed-Mobile Convergence and Substitution

Integrated Operators are those Telecommunications groups the Mobile Operators are part of or represent a specific brand[64]. As discussed before (see 1.2.4), convergence can be achieved at three different levels but here the focus is just on the services level, where Operators are capable to offer triple- or quadruple-play services to consumers.

Operator	Fixed broadband	Fixed voice	TV	Mobile [65]
TIM [66]	X	X	X	X
Vodafone	-	X	X	X
Wind [67]	X	X	X	X
Tre	-	-	X	X

Table 6 Italian Integrated Operators

Operators' current offerings are results of the different paths they have been following for the last decade. For example, *TIM* is the mobile brand of *Telecom Italia*: the past incumbent that has progressively expanded into the mobile world. Similarly did *Wind*, which started as Fixed Operator breaking *Telecom Italia*'s monopoly in 1997. Different story behind *Vodafone* and *Tre*: born as Mobile Operators, they enlarged their offerings encompassing TV (*Tre* was the first in the Italian market). Acquiring the fixed-line Operator *TeleTu* since 2007 (see 5.1.2), *Vodafone* is also active with fixed voice services (only by *Vodafone*, which allows number portability from fixed to mobile lines).

Talking about **Fixed-to-Mobile substitution**, it is interesting to focus on users' usage of both fixed and mobile networks. Analyzing voice services perfectly fits this purpose. To make a comparison among the main European countries the chosen metrics is monthly outbound minutes per capita (Figure 32). It emerges that Italians are the heaviest mobile phone users (163 min) in the EU5. Just Sweden performs better (182 min). Moreover, together with Spain, Italy is the only country where mobile phones are used more than fixed ones for voice services.

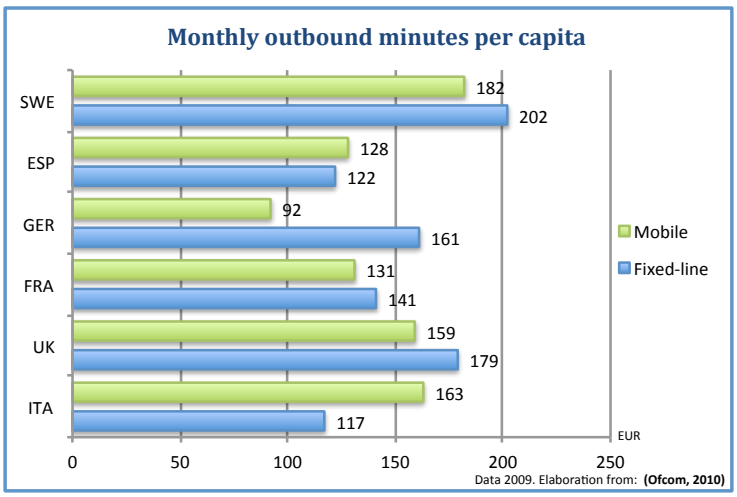

Figure 32 Monthly outbound minutes per capita in the main European countries

[64] Fixed Operators offering mobile services as MVNOs (i.e. *Fastweb* and *Tiscali Mobile*) are excluded.
[65] The term is here used encompass the whole mobile services ecosystem (see 1.1.3).
[66] Part of *Telecom Italia* group.
[67] Part of *Wind* group.

Focusing just on the Italian context, it is useful to analyze the evolution of voice services usage in the country looking at the total amount of traffic minutes from mobile and fixed networks. With the available data, it is possible to reconstruct the trend starting from 2007. As shown in Figure 33, the outgoing traffic minutes from mobile networks have exceeded those from the fixed networks during 2008. Italians prefer calling from mobile rather than fixed phones, therefore the substitution is an ongoing process and it is one of the indicators that explain why Italy has to be considered a mature market for Telecommunications.

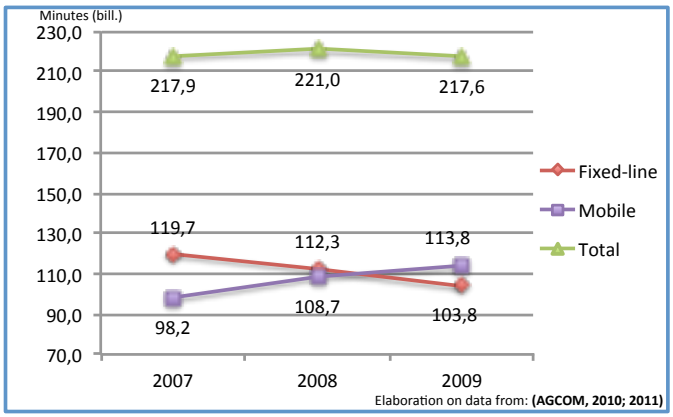

Figure 33 Fixed-line and mobile voice services usage in Italy (2007 – 2009)

2.2.5 Mobile payment & Operators

Mobile payment is growing very slowly in Italy. During 2010 just two new Mobile Remote Payment initiatives were initiated, reaching the total amount of 65. Moreover there is no actual Mobile Proximity Payment service available in the country. (Osservatorio NFC & Mobile Payment, 2011) This stall is caused by:

- **Directives transposition**. Two are the European directives relevant for Mobile Payment initiatives (see 1.2.6.3). While the PSD has been adopted in Italy during 2010[68], the EMD has still to be adopted. Just when the transposition will be done, the rules for Mobile Payment initiatives in Italy will be clear.
- **Availability of NFC phones.** NFC phones are one of the easiest ways to access Mobile Payment systems (see 1.2.6.2). The offering is very limited on the Italian market. Among the smartphones, the first *Android*-based device to be NFC-capable (*Nexus S* by *Google*) has been recently launched.
- **Consumers' behavior.** Italian users are less familiar and confident with electronic payment systems then users in other European countries (Talarico, 2009).

Looking more into the detail, it emerges that most of the Mobile Remote Payment initiatives are parking services (60%), tickets for public transportation (18%) and top-up cards for mobile subscriptions (8%).

[68] D.lgs N° 11/2010.

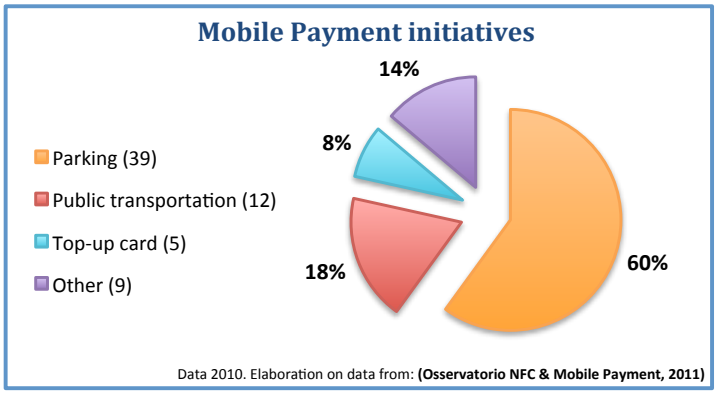

Figure 34 Mobile Payment initiatives in Italy

The most common charging system is pre-loaded credit, i.e. for parking services, (58%) followed by credit/debit cards (37%). Just 5% of the services allow user to pay with phone credit.

Within this scenario Operators have recently launched a very interesting initiative that is presented later in the case studies (see 5.1).

2.2.6 4G: the new technological challenge

As in most of the other European countries Mobile Operators will develop the Next Generation Networks (NGN) using LTE technologies. 500 Millions EUR is a rough estimation of the **investments** needed to cover a piece of land where 10 millions people live (see 1.2.7.1).

These investments encompass even the **spectrum**, whose availability and associated timing play a crucial role in 4G development. Moreover LTE investments are correlated to which frequencies Operators will obtain with the auctions because the higher the band frequency is the more LTE base stations need to be installed (see 1.2.7.1). The Italian regulator for communications industries, *AGCOM*, is heading an extensive bands re-farming to be completed by the end of 2013 when 800 MHz, 900 MHz, 1800 MHz and 2600 MHz bands will be available for the Operators (Guadagnuolo, 2011a). These are the bands that will be used for LTE networks. This final configuration is aligned with what will happen all over Europe (see 1.2.7.2).

Bands	Status	Operators
800 MHz	To be auctioned	-
900 MHz	Operating, with some slots available	*TIM, Vodafone, Wind*
1800 MHz	Operating, with some slots available	*TIM, Vodafone, Wind, Tre*
2600 MHz	To be auctioned	-

Table 7 Bands for LTE-based networks in Italy

Band auctioning is a highly country-specific phenomenon. Therefore comparing Italy with other European countries is difficult. From here the decision to focus just on the Italian context and analyze how and when the bands will be made available for Mobile Operators. An executive at *Wind* declared that *<<Auctions are expected to generate 2,5 billions Euros of revenues on the country´s budget [...] Therefore each Operator is expected to invest about 600-700 millions Euros for acquiring the licenses>>* (Lavezzari, 2011).

800 MHz band will be made available when the analogue switch-off process will be concluded. This process has been completed in most of the European countries but not in Italy. Therefore making predictions about when the auction will take place is not possible at the moment.

900 MHz band is subject to re-farming at a European level (see 1.2.7.2). European directives have been transposed[69] in Italy where spectrum has been rationalized. As a result 2 slots of 1,4 MHz have to be assigned[70].

1800 MHz band is subject to re-farming as well. Two slots of 5 MHz have been assigned to *Tre* during 2011. Additional two slots of 20 MHz are planned to be made available.

2,6 GHz band has never been used by Mobile Operators in Italy. *AGCOM* is evaluating when and how proceed with auctions, which might take place during 2011 (AGCOM, 2010; Longo, 2011).

Besides spectrum problems, it is interesting to look at Operators' **investments plans for 4G technologies** for the future. Information about Operators' plan are analyzed later (see 5.1). Anyway, gathering together the information in the case studies allows stating that first commercial launches are expected to take place at the end of 2012 / beginning of 2013. Italy is three years behind the early adopters: Sweden and Norway (see 5.2). This performance is anyway aligned with most of the other EU5 countries, which are expected to launch LTE-based offerings during 2012 (see 1.2.7.1).

[69] Del. N° 541/08/CONS.
[70] Owing an UMTS license for 2100 MHz band, *Tre* is the most likely candidate for obtaining this slot.

2.3 Summing up: Italy at a glance

Italy can be considered as the most mature Mobile Telecommunications market among the EU5 for the following reasons:

- **Connections**: highest penetration rate of SIM cards and highest percentage of 3G connections (see 2.1).
- **Voice services**: Italians are the heaviest mobile phone users for voice services (see 2.2.4)
- **Data services**: highest rate of Mobile Broadband connections (see 2.1).
- **Other mobile services**: Italians are the heaviest users of social networks on a global scale (see 2.1.3).
- **Devices**: second highest penetration of smartphones after Spain (see 2.1).

These trends are the reason why mobile services usage has been increasing for the last years. While voice and SMS have moderately grown, data services have exploded: +81% (see 2.1). Despite this growth, Italy has performed worse than other countries in terms of **mobile ARPU** (see 2.1), which has substantially been falling (-21% in the last four years). This trend is anyway compensated by the high **penetration rate**.

To cope with data explosion, Operators are required to do heavy investments in network infrastructures. **LTE technologies** are ready to be used but Italian Operators are not planning to implement them in the immediate future also because the bands are not going to be auctioned by the end of 2011 (see 2.2.6). *TIM* and *Vodafone* are proceeding on similar paths: they are heavily investing in HSPA+ technologies and planning to start LTE-based commercial offerings at the beginning of 2013. *Tre's* and *Wind*'s role is unclear as there is no actual timeline for implementing HSPA+ and LTE networks.

The **Open Mobile** paradigm is conquering Italy too. The most interesting initiative involves all the Mobile Operators to develop a common mobile payment platform (see 2.2.5) that will allow mobile subscribers to pay for digital contents on Internet (off-portal) with their phone credit.

Virtual Operators play a marginal role: for number and market share Italian MVNOs are extremely behind the other EU5 countries even if the business models are interesting (see 2.2.2). Thanks to its network, *Tre* is very active as HNO. Some Fixed Operators (as *Tiscali* and *Fastweb*) are approaching the mobile market as Virtual Operators to achieve convergence.

3 Theoretical framework

The previous part of the work is focused on analyzing the Mobile Telecommunications industry in Europe looking at both structural characteristics and current trends. This analytical scheme is subsequently applied to the Italian market to have a more detailed overview.

The overall objective of the investigation is to answer to the questions formulated before (see 1.3) by developing a value network model that has Mobile Services platforms at its core. To accomplish this task, building a valid theoretical framework is needed. This framework has two pillars:

- Developing knowledge about how the Mobile Telecommunications industry can be modeled as a value network (3.1).
- Investigating how the platform concept is applied to the Mobile Services domain and which are the actors involved (3.2).

3.1 Modeling the Mobile Telecommunications industry as a value network

Mobile Telecommunications industry is one of service economy pillars. Therefore, with the final goal of mapping this industry with a value network approach, it is interesting to have a quick overview on the value network concept (3.1.1) and its general model for service industries (3.1.2). Subsequently the focus goes onto the Mobile Telecommunications industry, looking at the entire value network (3.1.3) and sketching a model of Operators´ direct network (3.1.4).

3.1.1 From value chains to value networks

Porter was the first to introduce the concept of value chain in his book *Competitive advantage: creating and sustaining superior performance* (1985). He claimed that an enterprise can be seen as a **value chain** constructed by **value activities**, while the value chain of upstream and downstream constitutes the value system of the industry.

Scholars agree that value creation process in the service economy is not as sequential as the one portrayed in Porter's original idea, where the value is created passing through sequential value-adding stages (Pagani & Fine, 2008). Indeed, products and services are now designed, created, delivered, and provided to customers via complex processes, exchanges, and relationships. Therefore a new and updated perspective should be taken into consideration, using the term **value network** rather than value chain (Wu, Zhang, & Chen, 2010). Value networks are composed by complementary nodes and links (Peppard & Rylander, 2006). Actors collaborate to deliver value to end-users; each actor takes some responsibility for the success or failure of the network (Bitran et al. in Pagani & Fine, 2008).

While layered models stress the correspondence between technological design and industry structure, value chains emphasize the linear stream of activities adding value to a particular product or service, without necessarily addressing issues of technological modularity and functional architecture (Ballon, 2009). Value networks can be seen as a way of dealing with the rigidities of both these modeling approaches.

Indeed, rather than simply mirroring any technical layering, this representation is centered on revenue streams between various actors (Ballon, 2009). This approach thus views the activities of an organization in a holistic, rather than a fragmented, manner. Consequently, the network perspective shifts the focus from a resource-based view of the firm to a perspective in which examination of resource dependency, transaction costs, and actor-network relationships is critical. One must not only understand who the actors are, but also have an understanding of the types and extent of relationships involved (Basole & Rouse, 2008). Indeed they key strategic task is the reconfiguration of roles and relationships among this constellation of actors in order to mobilize the creation of value in new forms and by new players (Ballon, 2009).

Networks do not remain stable but evolve over time. Evolution can be pushed by particular events (i.e. competitors strategies, new technologies) or regulatory events, which change network structure and configuration (Peppard & Rylander, 2006). For example, the *iPhone* introduction in 2007 has had a tremendous impact on the entire Mobile Telecommunications industry.

These kinds of networks are **buyer-centric**: end-users have the crucial role to pull the value network by creating demand and setting the rules of engagement (Pagani & Fine, 2008). They do not value the service itself but rather the benefits (entertainment, communication, etc.) they receive consuming it. Last researches stress the fact that consumers are not only value receivers, but also co-producers (or *prosumers*) of value (Basole & Rouse, 2008).

Ghezzi, Renga, & Cortimiglia (2009) identify a set of **static** and **dynamic** variables describing value networks. The former define network´s structural characteristics:

- **Network focal**: the firm positioned in the center of the network, controlling the original source of value, and linking the "peripheral" firms.
- **Critical network influences**: the most significant value creating relations between firms.
- **Structural equivalences**: the condition where two or more members hold a similar position within the network.
- **Structural holes**: the situation where two or more firms within a network are connected only through the focal firm.
- **Revenue streams**: the direct or indirect exchanges of revenues between network members.

The latter explain network´s evolution due to endogenous and exogenous forces:

- **Lock-in and lock-out effect**: the condition where the establishment of a relation with a given firm sets constraints to the creation of further relations with other firms.
- **Learning races**: the case where firms involved in a relation find themselves competing in a race for internalizing the partner's assets and resources, before leaving the alliance. This is most likely to happen when private benefits acquirable by any of the partners after they have learnt from the other exceed the common benefits of the alliance.

3.1.2 Service Value Network

Basole & Rouse (2008) develop a conceptual model of a Service Value Network (Figure 35), whose actors are:

- **Consumers**: use services enabled by the other actors in the value network.
- **Service Providers**: focal actors in the network and primary contact points for a consumer. They supply communications services, etc.
- **Enablers**: help the service providers to create, design, initiate, and deploy the service. They can be distinguished in:
    - **Tier 1 enablers**: provide direct goods and services to the Service Provider.
    - **Tier 2 enablers**: provide goods and services to Tier 1 enablers.
    - **Auxiliary enablers**[71]: essential to the entire ecosystem and not specific to one industry. They tend to have an influence on some or all actors in the value network.

All of the actors in the services ecosystem act in a frame defined by society, culture, the economy, and politics, which generate contextual influences that can have a deep impact on economic activities.

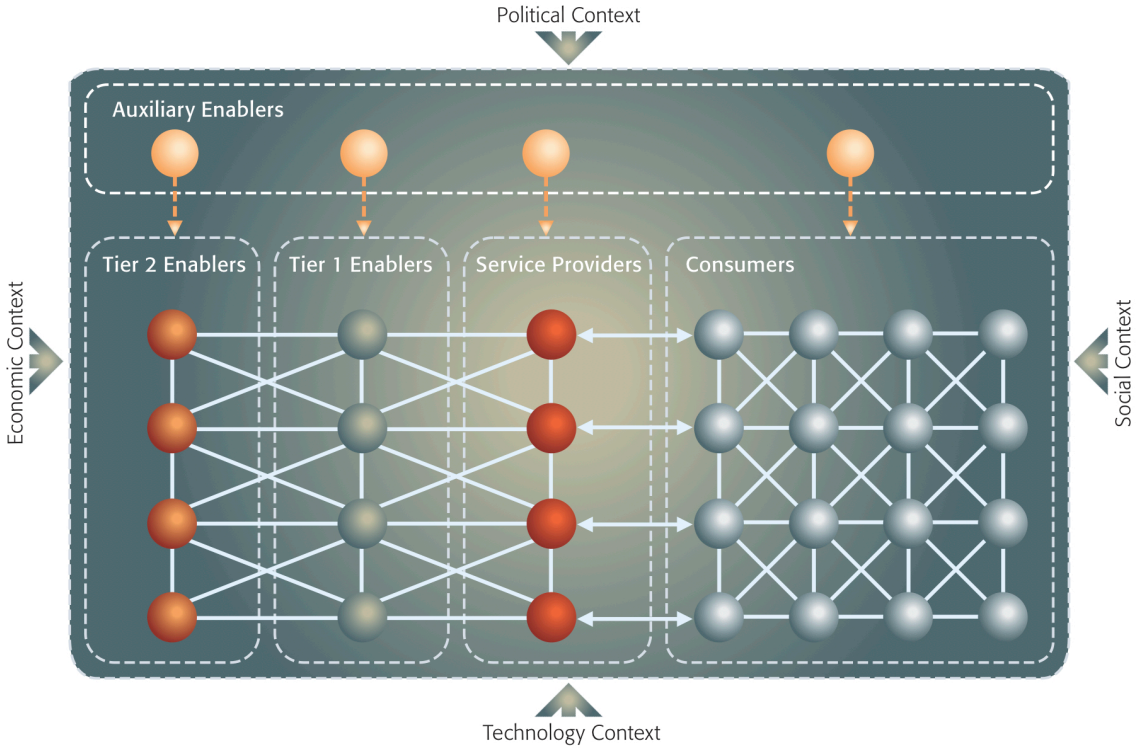

Figure 35 Conceptual Model of Service Value Network (Basole & Rouse, 2008)

[71] Examples include government agencies, financial institutions and infrastructure providers.

3.1.3 The Mobile Telecommunications value network

Different approaches to define the Mobile Telecommunications value network (or simply **Mobile value network**[72]) and its components emerge from the literature: some scholars focus their attention just on specific aspects (such as listing activities, actors or resources), while some others attempt to get a wider picture by modeling the network structure. Here the aim is to encompass as many contributions as possible to gather a wide range of information.

Making an attempt to put some order among past researches, Wulf, Zarnehow & Duser (2007) state that the Mobile Operators carry out the following **value activities**:

- **Transport**: carriage of data from sender to receiver. This activity relies on the ownership, operation and management of network infrastructures.
- **Hosting & delivery**: management of server infrastructure for hosting the server-side applications to support content and servers.
- **Terminal Management**: activities related to the consumer's device.
- **CRM & Billing**: consumer oriented management activities.
- **Content & Service Management**: all tasks related to functional design, development and management of the content and services provided to consumers.

Using different terms, Cricelli, Grimaldi & Ghiron (2010) identify six different value activities grouping them into three **layers**:

- **Network infrastructure**: network equipment and spectrum, infrastructure and operations.
- **Mobile service development and supply**: tariffing and billing, network services and products.
- **Interface with the end-users**: distribution and marketing, customer-care.

Figure 36 The Mobile Operator value chain (Cricelli, Grimaldi, & Ghiron, 2010)

Their approach (Figure 36) is still anchored to the classic Porter's fashion. Due to the previous observations about having value networks rather than chains, their contribution to this work is limited just to the idea of classifying value activities in distinct groups.

De Reuver & Bouwman (2008) focus their attention on the resources (tangible and intangible) spread in the network. They can be clustered in four categories:

- **Network related**, consisting of:

[72] Ghezzi, Balocco, & Rangone (2010).

    - **Physical Network Infrastructure**: antennas, base stations and core network.
    - **Connectivity**: the infrastructure has to be operated on a day-to-day basis (i.e. network traffic needs to be handled). This connectivity is typically offered by the MNOs[73].
    - **Handsets**: required by the end-users to receive services. Handset providers offer them.
- **User related**, consisting of:
    - **Identification and authentication**: needed to personalize services and to be able to identify the consumer[74].
    - **Billing facilities**: required for charging the user for those services that involve premium priced content[75].
    - **Customer support**: often required for Mobile Internet services. While multiple actors can be accountable for proper functioning of the service and fair billing, there is often one point of contact available to the end-user in case of problems.
    - **End-user data**: required for many facets of service delivery. Information on which handset and browser is being used is required for a proper presentation of the content to ensure a good service experience. Moreover, to allow context-aware services to be provided, dynamic information about the context of the user is needed (see 6.3).
- **Application related**, consisting of:
    - **Content adaptation platforms**: required to adapt web-based content to a WAP-based format that suits the specific user device.
    - **Micro-browsers and Java applications:** required by the end-users to access services.
    - **Platforms**: running applications on platforms allows consumers to access Internet services on their mobile devices and enable enterprises to extend their commercial applications to the mobile network[76].
- **Content related**: raw contents are created by Content Developers or generated by users (user-generated contents). They are typically sold on a wholesale basis to Operators or Providers of content and applications.

[73] MVNOs can play the role of agent between the network operator and end customers.
[74] Especially for mobile banking services, secure and reliable authentication methods are required. Typically, this is done through SIM card based methods provided by the Mobile Operator, but alternative web services based approaches are emerging as well.
[75] The Billing and Collections provider issues bills and arranges for collection of payments from customers, either through prepaid or post-paid billing arrangements. The same actor usually takes care also of accounting and dividing the revenues among the actors involved in offering the service. Usually MNOs play this role, although other actors in the fixed Internet and banking domain are also adopting this role.
[76] At the moment only few platforms are developed in-house: the actors primarily come from the computing industry (i.e. OS and middleware vendors).

Resources spread all over the network brings to light the above mentioned resource dependency problem. Analyzing resource dependencies helps to understand how actors (can) behave in value networks and how those value networks evolve over time.

The work by Wu, Zhang & Chen (2010) is focused on identifying the actors operating in the network; they can be classified as follows:

- **Content and application service developers**;
- **Portal and access service providers**;
- **Wireless network operators**;
- **Service support providers**;
- **Terminal platforms and application providers**.

Several scholars encompass models that help to visualize the value network. Basole & Rouse (2008) propose a simple model in accordance with the Service Value Network seen before (3.1.2).

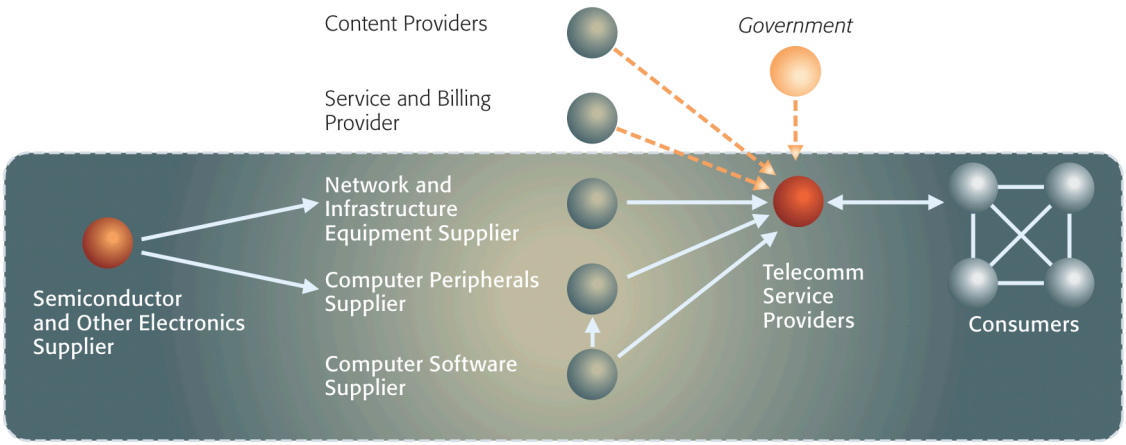

Figure 37 Value Network of the telecom market (Basole & Rouse, 2008)

Pagani & Fine (2008) have gone further, sketching a value network composed by the value chains of five principal actors:

- **Content providers**;
- **Application providers**;
- **Infrastructure providers**.
- **Network providers**.
- **Device providers**.

The resulting value network (Figure 38) is represented by five branches, one for each of the above mentioned value chains. It is more complicated than the previous one but it is more complete too, including resources and connecting them to the actors.

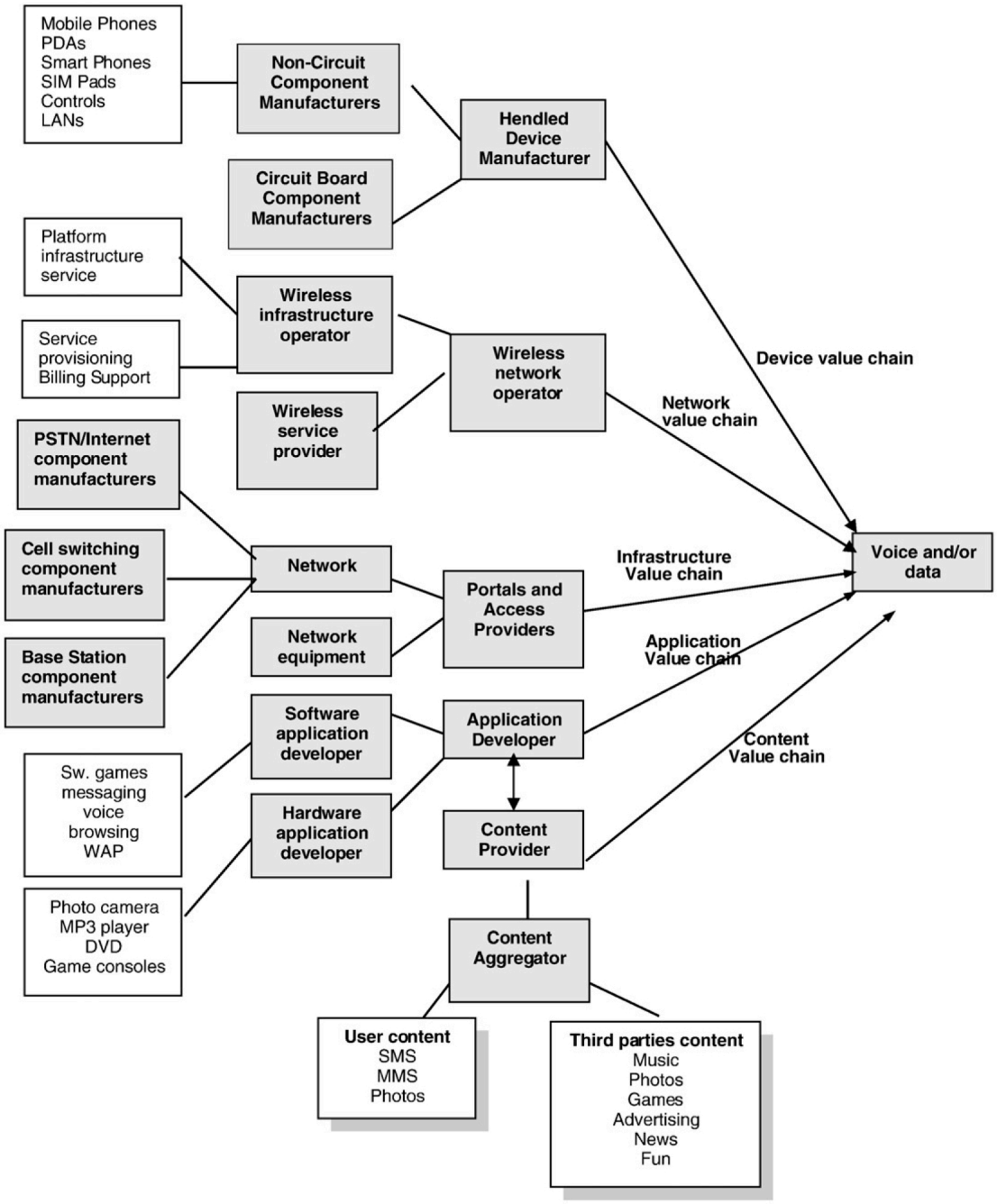

Figure 38 Mobile Operators Value Network Structure (Pagani & Fine, 2008)

Ballon's contribution to the subject is remarkable. The author identifies nine **actors** (marketplace entities that encapsulate a coherent set of business roles)**:**

- **Device Manufacturer** (DM): develops and builds mobile devices.
- **Platform Operator** (alternatively called **Platform Provider**, see 3.2.1.2).
- **Meta Platform Operator** (MPO): facilitates information exchange between services residing on different platforms.
- **Network Operator** (NO): provides connectivity.
- **Portal Provider** (POP): aggregates service and content, including service level authorization and single sign-on functions.

- **Service Provider** (see 3.2.1.2).
- **Service Aggregator** (SA): gathers a portfolio of services and bundles.
- **Content / Application Producer** (CP / AP): produces/develops mobile contents and applications. Alternative terms are **Content / Application Developers**.
- **User** (alternatively called **End-user**, see 3.2.1.2).

Actors are marketplace entities that encapsulate a coherent set of business **roles** (discrete sets of responsibilities, actions, activities and authorizations that together have a coherent value-adding logic[77]):

- End usage/consumption.
- Device ownership.
- Mobile subscription.
- Advertising.
- Subsidizing.
- Service delivery.
- Payment provision.
- Application provision.
- Portal provision.
- Network connectivity.
- Spectrum ownership.
- Application development.
- Content aggregation.
- Backbone network operation.
- Device manufacturing.
- Network equipment manufacturing.
- Service platform development.
- Content production/ownership.

Recombining roles among actors, the author identifies different scenarios. The first one (Figure 39) is the most generic: every actor carries out exactly one role. In other words, there is no role/actor bundling. Thus this generic model is defined as *completely unbundled.*

[77] According to the author explanation, we can consider roles as more than just value activities.

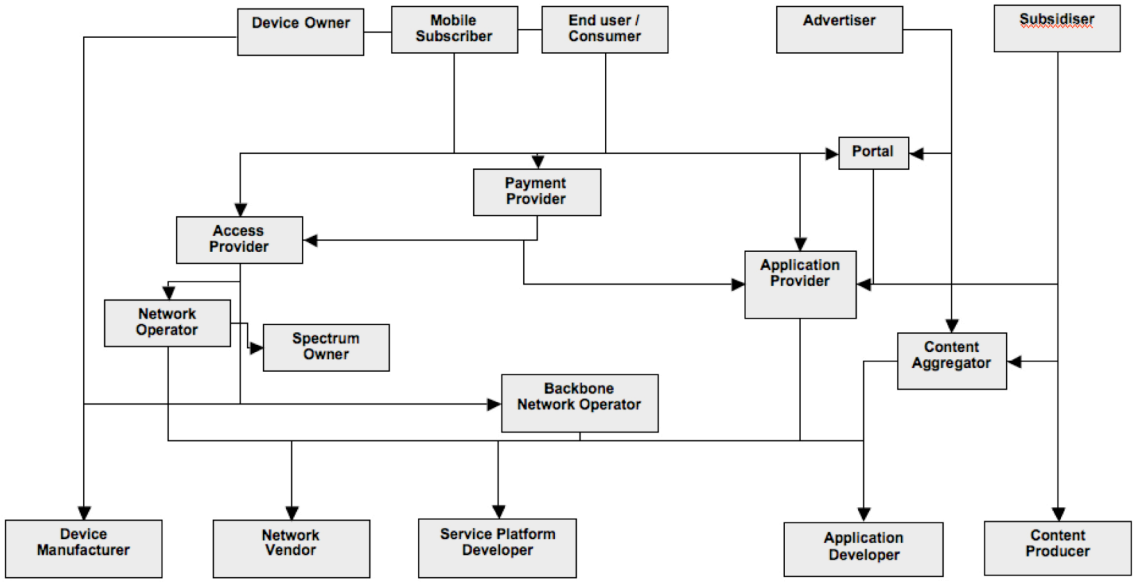

Figure 39 Generic Mobile Value Network (Ballon, 2009)

Starting from this model, different configuration can arise from the recombination of roles/actors as well as from the addition of new roles and the redefinition/deletion/split of existing roles. Therefore, the author presents a *largely unbundled* instantiation (Figure 40), where a number of actors take up several roles.

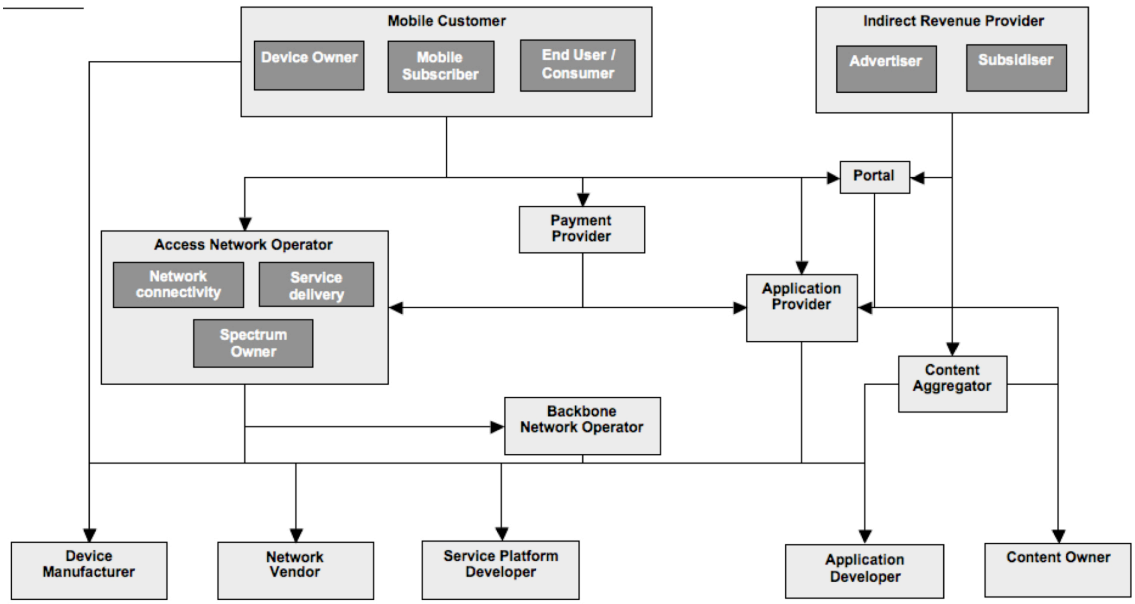

Figure 40 Instantiation of Largely Unbundled Mobile Value Network (Ballon, 2009)

A *largely integrated* model is presented too (Figure 41), to depict the situation where Mobile Operators and the Equipment Manufacturers bundle most of the roles.

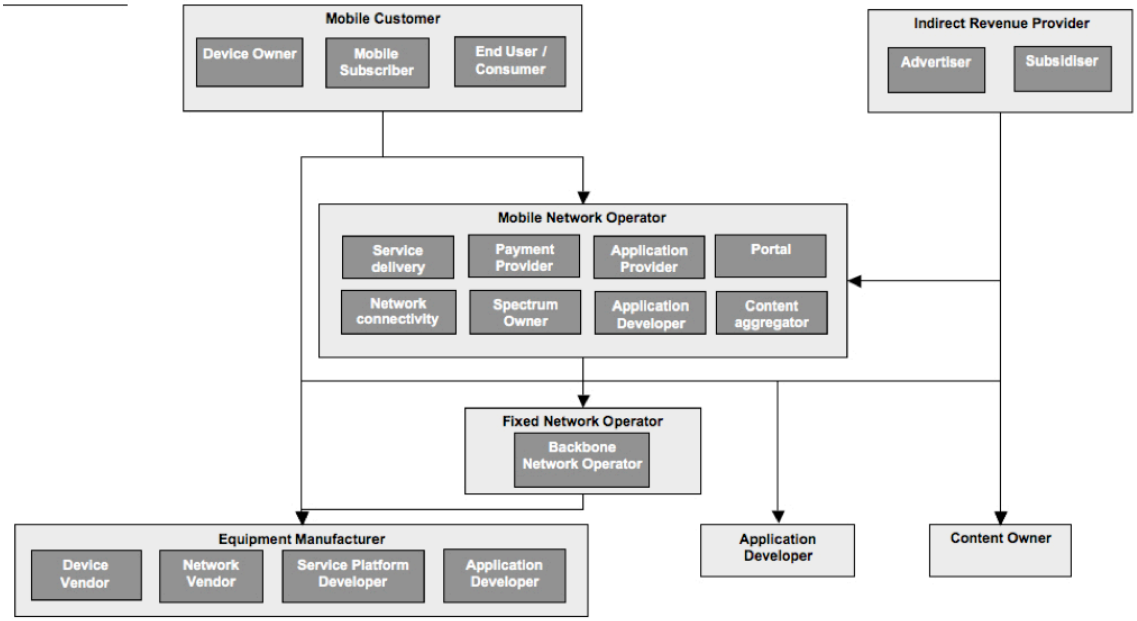

Figure 41 Instantiation of Largely Integrated Mobile Value Network (Ballon, 2009)

A similar approach is followed by Ghezzi, Renga, & Cortimiglia (2009) who define four different value network configurations, recombining the allocation of value activities within the actors. This contribution is analyzed in the next sections (see 7.3).

3.1.4 Mobile Operators´ direct network

To easily gather together the above observations, a simple model of the Mobile Operators' direct network has been developed using the *e³value ontology* (see 7.1). Figure 42 illustrates how MNOs and MVNOs operate in the wholesale and retail market. MNOs' value offering consists of mobile services (to the consumers, in the retail market) and wholesale capacity (to the MVNOs, in the wholesale market). MVNOs offer mobile services to the consumers too.

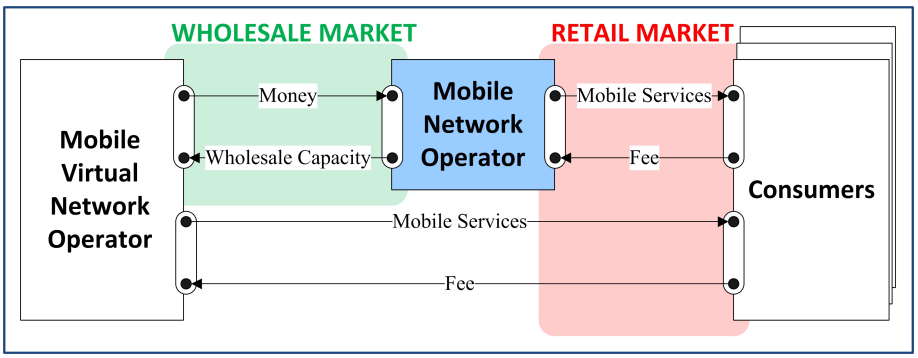

Figure 42 MNOs and MVNOs: wholesale and retail market

The term fee is used to generically describe a value object related to a payment (Ballon, Walravens, Spedalieri, & Venezia, 2008; Ghezzi, Renga, & Cortimiglia, 2009; Goncalves, Walravens, & Ballon, 2010). Anyway a distinction has to be made:

- Per-use fee, to indicate a payment related to one concrete product (SMS/MMS, contents, etc.). A real-life example is *Apple*'s *App Store*, where one pays for every single application downloaded.
- Subscription fee, to indicate a payment that is regulated by an ongoing relationship. An example is *Spotify*'s premium service, where one pays a monthly fee to have unlimited access to all the tracks available on the platform. For the purpose of this investigation, services such *Spotify* are classified as contents for the following reasons: consumers have to download an application (content) providing access to a range of services.

Figure 43 illustrates an even simpler model that represents the approach leading this investigation from now on:

- No distinction (if not specified, as in 1.2.2) between real and virtual Operators: the generic term Mobile Operators will be used.
- Focus on the mobile services offered by the Mobile Operators to the Consumers.

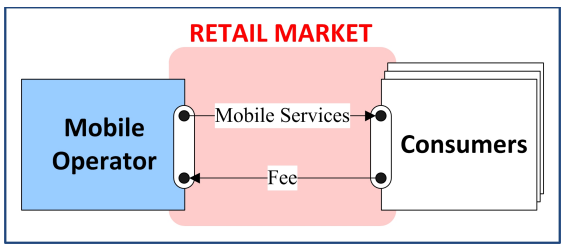

Figure 43 Mobile Operators in the retail market

3.2 Mobile Services platforms

Mobile Services platforms represent one of the most important paradigms in the industry: companies as *Apple, Google* and *Facebook* have successfully married new consumer devices and Internet platforms with a variety of online services and content undermining Operators´ central role in the value network.

Before focusing on this specific topic it is important to agree on the terms are going to be used looking the "traditional" platforms theory (3.2.1). Then the approach followed to analyze the literature is discussed and the main results and comments are shown (3.2.2). Third (3.2.3), the most important contributions emerged from the analysis are presented.

3.2.1 The platforms theory applied to the Mobile Services domain

The first step to analyze Mobile Services platform is to agree on the terms that will be used from now on by giving a general definition of platform (3.2.1.1), making clear the difference between Services, Contents and Applications (3.2.1.2) and transposing the platform concept into the Mobile Services domain (3.2.1.3).

3.2.1.1 The platform concept

The term **platform** has already been introduced with a technical meaning, referring to IP-based platform network architecture (see 1.1.2). Keeping a technological perspective, the following platform definitions emerge from the literature:

- Core subsystem, interface and architecture that is reused to achieve competitive differentiation. It is often characterized by a modular architecture[78] (Ballon, 2009).
- Hardware configuration, operating system, software framework or any other common entity providing the basic functionalities to make services run on it and offer them to end-users (de Reuver M. , 2011).
- Entity providing a Service Creation Environment, which supports the creation of composite services through a graphical tool and a Service Execution Environment in which mash-ups are deployed and executed (Stecca, Maresca, & Baglietto, 2009).
- Connectivity- and communications-enablers within and between services, aggregators, users, and other platforms (DesAutels, 2010).

Abstracting from the technical point of view, the term platform gets a wider perspective:

- Entity able to coordinate (both for technical and organizational aspects) the interactions between two or more distinct groups of stakeholders (i.e. Service Providers and end-users), to internalize the externalities created by one group for the other group and to attempt to control crucial roles within an ecosystem (Ballon & Walravens, 2008).

[78] Modularity has been pointed out to be one of the main characteristics of the whole Mobile Service domain (see 1.2.1). Therefore platforms are not just modularized internally but from the rest of the domain too.

- Agent that hosts services and enablers (enabling services) and provides them to end-users as well as to 3rd party service providers, who combine them with their own enablers and provide them as their own services to end-users (Zoric, 2010).
- Facilitator of users' transactions. It encompasses components (hardware, software, and service modules, along with an architecture that specifies how they fit together) and rules, which coordinate network participants' activities (including standards that ensure compatibility among different components, protocols that govern information exchange, policies that constrain user behavior, and contracts that specify terms of trade and the rights and responsibilities of network participants, etc.) (Eisenmann, Parker, & Van Alstyne, 2008).

Rather than to focus on profit maximization in a single market, the primary deal of a platform is to get the various stakeholders groups on board, balance interests between these groups and single- or multi-homing customers, i.e. customers that are "locked" into one or more platforms (Ballon & Walravens, 2008). Due to these characteristics, platforms can be considered a resource providing competitive advantage (de Reuver M. , 2011), involving several product lines or divisional boundaries and frequently requiring the resolution of cross-functional conflict. Platform main economical characteristics can be summarized as follows (Ballon, 2009):

- **Network effects and backward compatibility**. Platforms have interchangeable components: therefore many buyers can share the benefits of the same technical advance, introducing network effect [79] . Interchangeable components also permit users to profit from backward compatibility.
- **Economics of scale.** Platforms are associated with the idea of re-use across multiple sites. Moreover investments by buyers and platform sellers are characterized by positive feedback that might give birth to virtuous cycles associated with social scale economies.
- **Barriers to entry.** Above mentioned characteristics lead often to erect barriers to entry as, with buyers locked into a platform, sellers gain a powerful position to prevent competitors from having success.
- **Persistence over time.** A platform coordinates disparate and rapidly moving technologies. Both buyers and sellers make long-lived platform-specific investments that lead to platform persistence.
- **Hard to start, hard to stop, easy to maintain.** A platform needs a critical mass of adopters and a critical mass of complementary software (and sometimes other components). Therefore platforms switches (movements of large numbers of users from one platform to an incompatible or only

[79] The network effects can be direct (i.e. technical compatibility or interface standard) or indirect (i.e. when an overwhelming number of Application Developers, Content Producers, buyers and sellers, or Advertisers adopt a particular platform that requires complements to adopt a specific set of technical standards that define how to use or connect to the platform) (Cusumano, 2010b).

partially compatible one) are rare. Typically it takes a substantial new technological opportunity to get the new virtuous cycle going.

Every platform carries out its mediator task within a network, which comprises the following roles (Eisenmann, Parker, & Van Alstyne, 2008):

- **Demand-side users**, commonly called end-users.
- **Supply-side users**: offer *complements* to the platform, which are not part of the platform itself. These complements are employed by demand-side users in tandem with the core platform. The terms *complementary innovators* or *complementors*[80] are used too.
- **Platform Provider** (PP)[81]: mediates users' transactions by serving as users' primary point of contact with the platform. They supply its components and adhere to its rules.
- **Platform Sponsor** (PS)[81]: does not deal directly with users but holds rights to modify platform's technology. It designs the components and rules, and determines who may participate in the network as Platform Provider and users.

These networks can be categorized according to the number of distinct user groups[82] they encompass:

- **One-sided networks,** with homogenous users (Eisenmann, Parker, & Van Alstyne, 2008)**.**
- **Two-sided networks,** with two distinct user groups whose respective members consistently play a single role in transactions (Ballon & Walravens, 2008; Eisenmann, Parker, & Van Alstyne, 2008)**.**
- **Multi-sided networks,** with more than two user groups (Ballon & Walravens, 2008).

Each **platform-mediated network** has a focal platform at its core, although some complements offered by supply-side users may be platforms nested inside the focal platform. To create and maintain the focal platform, one or more intermediaries must act as Platform Provider and Platform Sponsor. Exchanges have a triangular structure: users transact with each other and simultaneously affiliate with the Platform Provider.

[80] See: Deloitte (2009), Ballon (2009), Cusumano (2010b).
[81] The roles of PP and PS may be filled by one company or shared by multiple firms.
[82] The term stakeholders is used too (Ballon & Walravens, 2008).

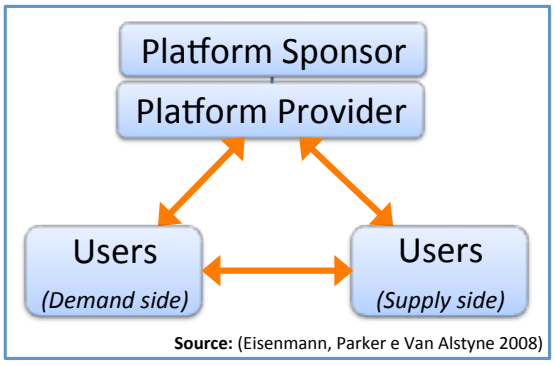

Figure 44 Platform-mediated network: triangular exchange structure.

Taking all these considerations into account, a platform can be simply defined as: *an entity that holds an environment (hardware and software solutions often organized in reusable modules) able to coordinate the interactions between complementors and end-users both in a technological and organizational way.*

3.2.1.2 The difference among Mobile Services, Contents and Applications

From the literature analysis, it emerges confusion with the concepts of Mobile Service, Content and Application. Therefore, some clarifications are needed with the idea of providing definitions that are easy to understand and to use, as well as mapping the link between the above-mentioned concepts.

Mobile Services are electronic services where a server (Service Provider) provides the required functionality to the user (who might use a Mobile Application as a client) through a device (see 1.1.4) connected to a wireless network (see 1.1.2). They can be split into voice and data services (see 1.1.3).

Due to their "being mobile", context awareness and personalization are the their main value drivers (de Reuver M. , 2011). Besides services involving end-users, there are also the so-called **enabling services** (either **enablers**): services at the system level that do not include a direct offering to the user, but rather provide a more low-level functionality (Ballon, 2009). Examples are SDK (Software Development Kit), APIs (Application Programming Interfaces), technical documentation and libraries.

The required functionalities might be **Mobile Contents**: any type of media that have a creative origin (intrinsic cultural, aesthetic or entertainment value which appears to be linked to their novelty and/or uniqueness) or come from processed information (identification of information and its timely adaptation to user preferences) (Feijoo, Maghiros, Abadie, & Gomez-Barroso, 2009). They are classified among data services (see 1.1.3).

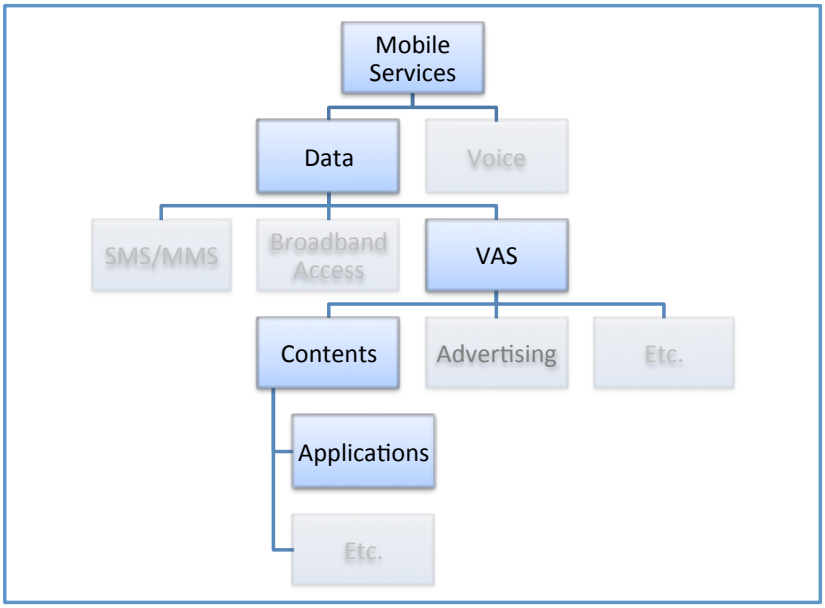

Figure 45 Services, Content and Applications: classification hierarchy

Mobile Applications are computer programs that are executed in a mobile computing platform (i.e. a Mobile Operating System, such as *Android* or *iOS*). They are a particular kind of Mobile Services (see Figure 45) with the following peculiarities (Ballon, 2009): they involve end-user interaction, while mobile services are more about encompassing offerings (including system-level processes, and enabling services).

3.2.1.3 Mobile Services platforms and Application Stores

As the platform concept has been widely implemented in the Mobile Service domain, understanding how a Mobile Services Platform works is crucial. First, it is important to state that the focus is centered on this kind of platforms with the goal of encompassing an amount of services as wide as possible. Indeed, limiting the analysis just on Content Platforms (i.e. Application Stores) would be reductive. Taxonomical choices (i.e. naming demand-side users as Service Providers instead of Content Providers) follow this approach.

Second, the actors involved in a Mobile Services platform have to be specified. For the moment, the idea is to have a basic understanding about how a platform works. More details are offered afterwards (see 7.2). Mobile Services platforms rely on the following actors:

- **Platform Provider** (PP): the actor providing and operating the platform. It facilitates an environment for services design, development and delivery through a platform that allows Service Providers to provide a service to the end-customer and get revenues from it. Thus a PP creates value for upstream Service Providers and downstream customers and extracts revenues from both sides (Goncalves & Ballon, 2011).

- **Service Providers** (SP)[83]: these complementors compose services by creating component and/or recombining and reusing modules available in the platform repository. Service Providers represent the first group of demand-side users (see 3.2.1.1), who can be professional as well as semi-professional entities. Platform value is given by:
    - **Device Neutrality**: services transfer between devices, with subsequent service adaption to fit the devices requirements.
    - **Easy service creation and/or publishing**: this approach helps to attract a critical mass of Service Providers.
    - **Enable access to service components**: accessing to components such as identification, monetization, search, etc. helps Service Providers to add value to their services.
    - **Diminished lock-in to proprietary platforms**: open and standard interfaces, portability of data/features, etc. lower Service Providers' risk of being stuck into a platform.
    - **Inter-domain service composition and brokerage of service elements**: enlarging the pool of service components as well as rendering the Platform Provider's role as broker is important for providing the possibility to create services spanning multiple domains.
- **Third Parties** (TP)[83]: complementors providing **raw services** that are not intended to be directly accessed by end-users but rather to enrich the Service Providers' offering (Decker & Bulander, 2009). Stecca, Maresca, & Baglietto (2009) identify them as those small companies that work under a partnership with a PP to ideate, implement and deploy specific applications (as mash-ups[84]). Small Medium Enterprises (SMEs) are perfect candidates for these business opportunities. Examples of raw services are: maps, news or information about traffic jams, etc.
- **End-users**[83]: access and consume services offered by the platform. Platforms value depends on:
    - **Amount of contents and services**: the current trend goes towards having a significant number of free or low-cost services, which are paid indirectly (advertisement, etc.).
    - **Ease of use / ease of discovery**: lower barriers to consumption (number of clicks, etc.).
    - **Community support**: enabling interactions within and between communities of interest and communities of practice.
    - **Personalized and customized services**: tailoring services to users' situation, profile and preferences.

[83] These actors are represented (Figure 87) with the market segment notation (see 7.1) to stress the fact that, besides being platform users, they equally evaluate value objects exchanged via each interface.

[84] Those service compositions that combine data sources and telecom services.

- **Service roaming**: ability to transfer services between devices, with different settings/characteristics and connected on different networks.

To keep the approach as simple as possible the role of **Platform Sponsor** (see 3.2.1.1) is here omitted.

Services can be delivered in a collaborative way between the platform and its complementors. Therefore there is a need to identify business and technical roles, responsibilities as well as negotiate Service Level Agreement (SLA) and Specification (SLS). Within SLA negotiation, incentives, revenue models and business positions have to be encompassed. (Zoric, 2010)

To conclude, the analysis deals with one of the most "fashionable" concepts nowadays: **Application Store** (see 1.1.3). It is a particular kind of Mobile Services Platform, where demand-side users create and provide applications rather than services (Stecca, Maresca, & Baglietto, 2009). This paradigm had a so huge impact on the Mobile Services domain that some scholars name the current industry configuration as *App Economy*. Coordination between Platform Providers and supply-side users is often regulated by **revenue-sharing contracts**, *Apple´s* revenue sharing model works like this: for every application sold on the *App Store*, *Apple* gets 30% of the revenue and the Developer 70%. This model has been gaining traction all over the Mobile Services domain and even the Mobile Operators have been adopting it, as confirmed by *Vodafone Italia*: *<< We use a 70/30 revenue sharing model as Apple on the contents available off-portal in the Mobile Internet>>* (De Carlo, 2011). These contracts revolutionize platforms triangular exchange structure (see 3.2.1.1). Indeed the exchange between supply-side users (i.e. Application Developers) and demand-side users (i.e. consumers) is missing: platforms are the focal center of all the exchanges.

3.2.2 Mobile Services Platforms in the literature

To have a deep insight about Mobile Services Platforms, 23 papers have been selected and analyzed. To have a rigorous approach, these papers are classified (3.2.2.1); then main results from the analysis are shown and commented (3.2.2.2).

3.2.2.1 Methodology to classify the papers

The papers have been classified according to two variables:

- **Complexity of platform concept.** How a platform is conceived represents the focal criterion used to analyze the scientific articles. To evaluate how articulated (complex) the platform concept is, each article has been given a score (★, ★★ or ★★★) according to the following guidelines:
    - ★: the platform concept is undeveloped. Platforms are considered just as: a list of value activities (Wulf, Zarnehow, & Duser, 2007), a mere role in the value network (Yoon, Yoo, & Choi, 2010; Holzer & Ondrus, 2009) or have country-specific technical meaning (Murata, Hasegawa, Murakami, Harada, & Kato, 2009).
    - ★★: the platform concept is developed but a complete overview is missing due to the fact that: the concept is confined to the technical level (Cobarzan, 2010; Villalonga, et al., 2009; Decker & Bulander,

2009; Zoric, 2009); no model is developed (Feijòo, Gomez-Barroso, & Ramos, 2010; de Reuver M. , 2011; de Reuver, Visser, Guillermo, & Bowman, 2010; Goncalves & Ballon, 2011; Goncalves, 2009; Stecca, Maresca, & Baglietto, 2009); the focus is about the Application Stores that represent just a subset of the domain (Hammershoj, Sapuppo, & Tadayoni, 2010; Holzer & Ondrus, 2011; Ghezzi, Balocco, & Rangone, 2010).

  - ★★★: the platform concept is sophisticated. Most of the contributions develop remarkable platform models (Ballon & Walravens, 2008; Ballon, 2009; Ballon, Walravens, Spedalieri, & Venezia, 2008; Goncalves, Walravens, & Ballon, 2010; Ghezzi, Renga, & Cortimiglia, 2009) or represent unique and interesting studies in the field, such as the idea of analyzing platform by a portfolio approach (Zoric, 2010).

- **Definition of the Mobile Services domain.** While the complexity of the platform concept represents an internal (to the platform) variable, defining the Mobile Services domain puts the platform in relation with the external world: the value network. It is extremely interesting to evaluate how the platform is inserted in a wider context that encompasses other actors besides the Platform Operator.

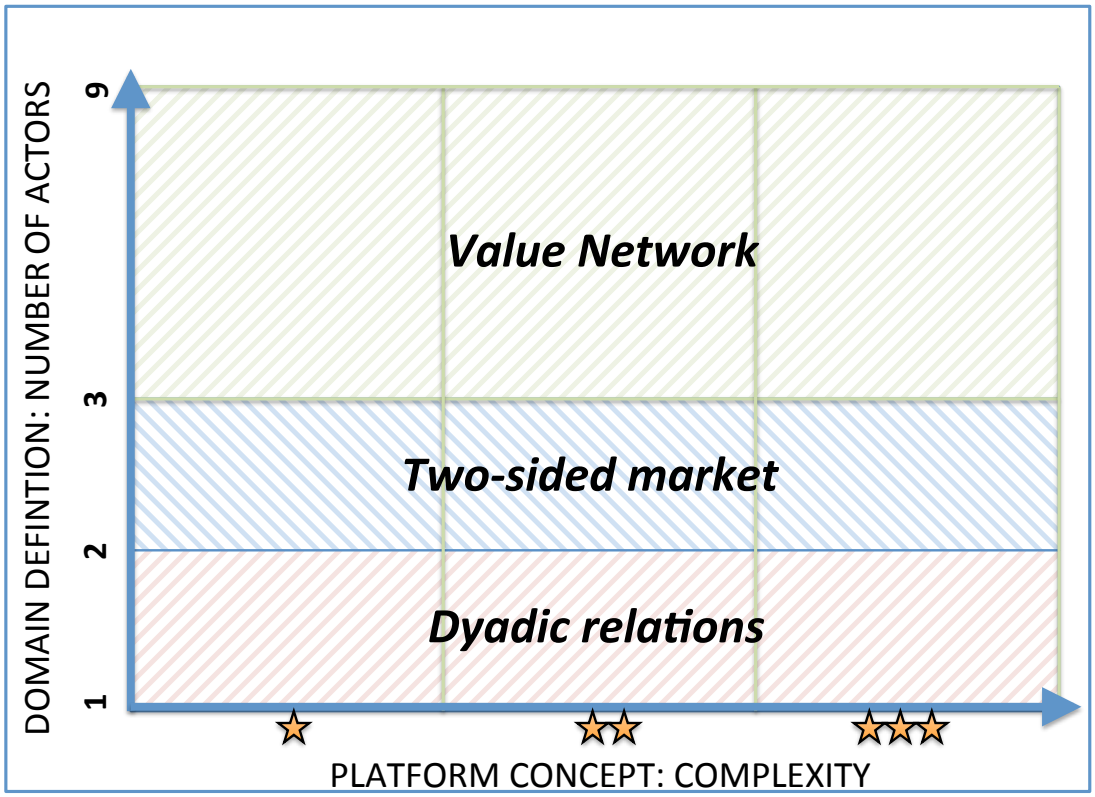

Figure 46 Clusters of articles according to the number of actors.

Every article deals with a certain amount of actors. This number represents a good and easy-to-obtain proxy to understand how the Mobile Services domain is described, following this simple rule: the more actors are encompassed, the more

complete the domain definition is. Using the number of actors as reference variable, three main clusters of articles are identified:

- **Dyadic relations (two actors).** A restricted number of papers (Cobarzan, 2010; Goncalves & Ballon, 2011; Villalonga, et al., 2009; Goncalves, 2009) have a very limited scope, focusing on the relation between Platform Operator and Service Provider(s), encompassing just the upstream direct network[85].
- **Two-sided market (three actors).** A greater amount of contributions (de Reuver M. , 2011; de Reuver, Visser, Guillermo, & Bowman, 2010; Decker & Bulander, 2009; Feijòo, Gomez-Barroso, & Ramos, 2010; Holzer & Ondrus, 2011; Zoric, 2010; Zoric, 2009), deal with three actors: Platform Operator, Service Provider(s) and end-users, following the classical two-sided market approach (see 3.2.1.1) that deals with the upstream as well as the downstream direct network[85].
- **Value network (more than three actors).** If there are more than three actors, the paper goes towards a value network approach. The cluster encompasses papers that deal with up to nine actors. This upper bound has been set looking at the paper by Ballon (2009), that is the most complete one.

Additional information, such as number of quotes[86] and release year, has been collected too. Moreover every article has been identified with a unique ID (see Table 8).

[85] From the Platform Operator's point of view.
[86] Source: scholar.google.com. Retrieval period: January 2011.

ID	Author(s)	Year	Quotes	Platform	Actors
01	Ballon & Walravens	2008	12	★ ★ ★	7
02	Ballon	2009	9	★ ★ ★	9
03	Ballon, Walravens, Spedalieri, & Venezia	2008	3	★ ★ ★	5
04	Cobarzan	2010	0	★ ★	2
05	de Reuver	2011	0	★ ★	3
06	de Reuver, Visser, Guillermo, & Bowman	2010	0	★ ★	3
07	Decker & Bulander	2009	2	★ ★	3
08	Feijòo, Gomez-Barroso, & Ramos	2010	0	★ ★	3
09	Ghezzi, Renga, & Cortimiglia	2009	3	★ ★ ★	6
10	Goncalves & Ballon	2011	1	★ ★	2
11	Goncalves	2009	0	★ ★	2
12	Goncalves, Walravens, & Ballon	2010	1	★ ★ ★	6
13	Hammershoj, Sapuppo, & Tadayoni	2010	0	★ ★	2
14	Holzer & Ondrus	2009	0	★	6
15	Holzer & Ondrus	2011	0	★ ★	3
16	Murata, Hasegawa, Murakami, Harada, & Kato	2009	3	★	7
17	Stecca, Maresca, & Baglietto	2009	0	★ ★	4
18	Villalonga, et al.	2009	11	★ ★	2
19	Wulf, Zarnehow, & Duser	2007	0	★	5
20	Yoon, Yoo, & Choi	2010	0	★	4
21	Zoric	2009	0	★ ★	3
22	Zoric	2010	2	★ ★ ★	3
23	Ghezzi, Balocco, & Rangone	2010	0	★ ★	7

Table 8 The dataset: scientific articles concerning the Platformisation in the Mobile Services domain.

3.2.2.2 Results

The figure below shows the graphical representation of the dataset, according to the above-mentioned variables. Each article is represented by its ID and a circle. The color depends on the release year and the diameter on how many times it has been quoted[87].

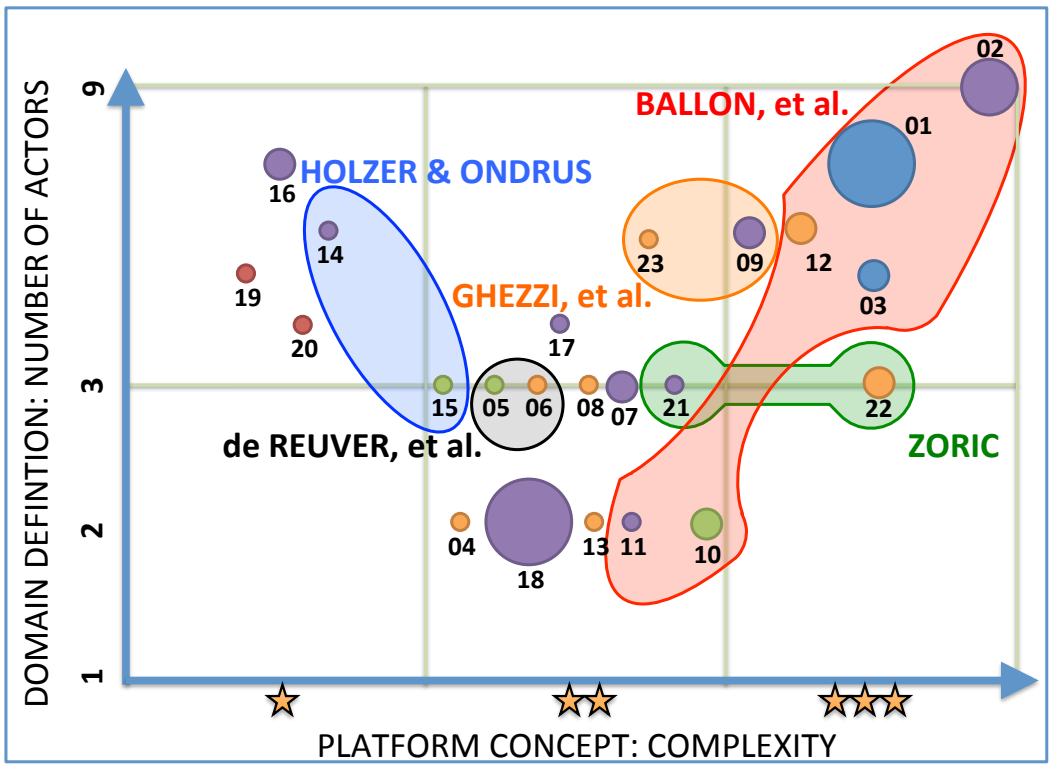

Figure 47 Graphical representation of the dataset.

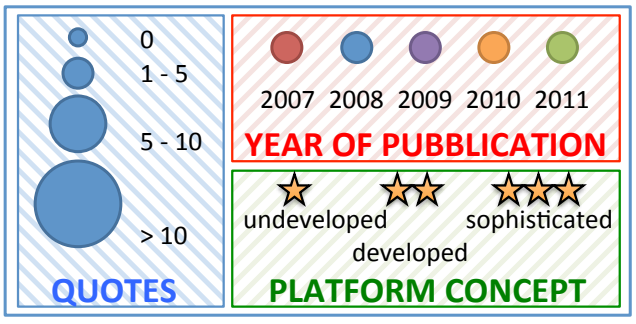

Figure 48 Legend.

Articles by the same author (or research team) are grouped together, as follows:

- **Ballon, et. al.** This research team is the most important one regarding this specific topic. Most of the scholars (Pieter Ballon, Vânia Gonçalves and Nils Walvarens) gravitate around the *Vrije Universiteit Brussel* (Belgium). Out of their vast amount of publications, six articles have been included in this

[87] Counting papers' quotes gives a good proxy to assess their importance within a limited research area. Nevertheless this approach has limitations in this specific context because the dataset is quite "young", including papers released from 2007 to 2011. Therefore these contributions might not have got the deserved attention yet.

dataset. The most important contribution is given by Pieter Ballon's PhD thesis (ID: 02), which remarkably describes platforms in the value network.

- **Ghezzi, et. al.** This research team works at the *ICT & Management Observatory, Politecnico di Milano* (Italy). Antonio Ghezzi is the specialist within the Mobile Telecommunications area. Among a vast number of papers, two have been selected as the most relevant for this topic.
- **Zoric**. Josip Zoric works at the *Norwegian University of Science* and Technology, Trondheim (Norway). He collaborates with *Telenor R&I*.
- **de Reuver, et. al.** This group, led by Mark de Reuver, is based at the *Delft University of Technology* (Netherlands).
- **Holzer & Ondrus.** Adrian Holzer operates at the *Polytechnique de Montréal*, *Université de Montréal* (Canada) while Jan Ondrus is based at the *ESSEC Business School*, Paris (France).

Analyzing the graphical representation in Figure 47, it emerges is the crucial role played by the research team led by Pieter Ballon due to the following evidences:

- **Number of articles.** This research group is the most prolific one, with 6 papers out of 23 (≈26% of the dataset).
- **Number of quotes.** These articles are the most quoted ones. Indeed, their papers totalize overall 26 quotes out of 46 (≈57% of the dataset). Anyway this evidence suffers of some limitations, as mentioned above (see note 87).
- **Number of cross-references.** Figure 49 shows the cross-references within the dataset: whenever a paper included in the dataset makes a reference to another paper in the dataset a dotted red arrow is drawed.

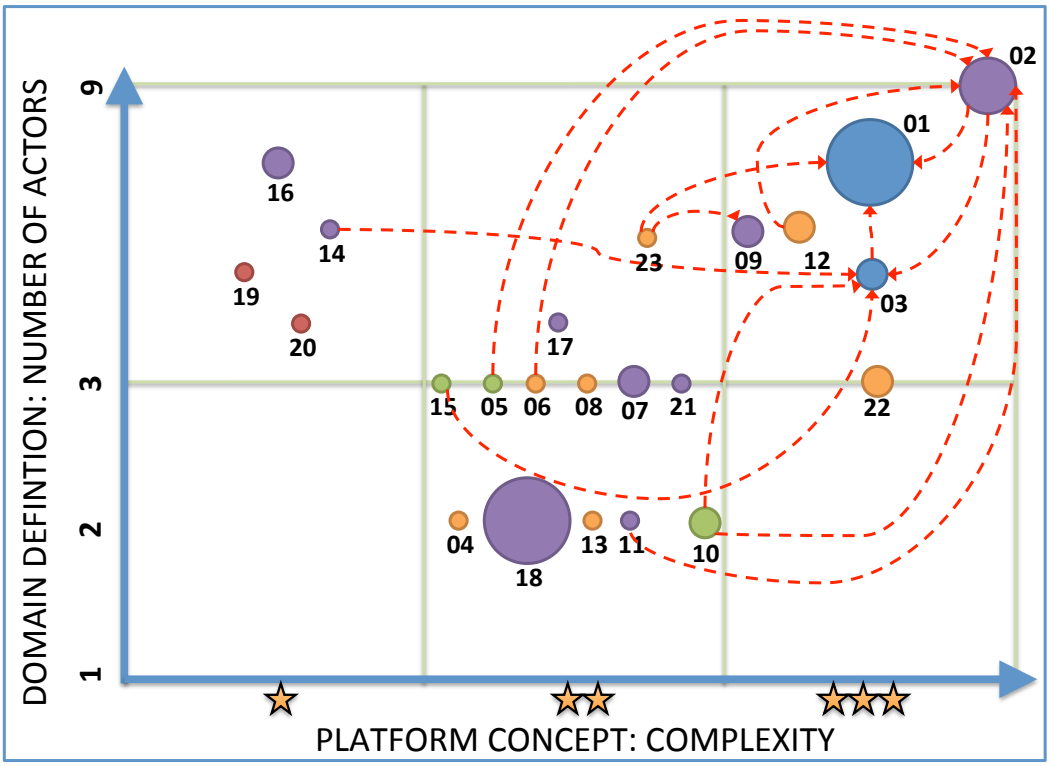

Figure 49 Cross-references among the dataset.

Looking at the graphical representation in Figure 49, it emerges that most of the papers in the dataset refer to papers developed by these scholars. Indeed, besides the cross-references internal to the research group, other 5 papers refer to these contributions. Moreover, besides one internal cross-reference between the papers by Ghezzi (ID: 06, 23), no other cross-references are present in the dataset. In accordance with what said before, the importance of Ballon's PhD thesis is remarked by the fact that it is the paper totalizing the biggest amount of cross-references.

- **Position of the papers.** The research group is strongly represented in the most "prestigious" area of the charts (★★★ and more than 3 actors): out of 5 papers placed in this area, 4 are by these scholars. Moreover their own literary production is strongly oriented to this area, due to the fact that 4 papers out of 6 are placed here.

Summing all these comments we can state that the research team based at the *Vrije Universiteit Brussel* gives a remarkable contribution within the specific topic of the Platformisation of the Mobile Service domain. Further developments of this investigation cannot leave aside these works. Anyway highlighting the importance of these articles does not mean that all the other contributions are marginal. Indeed many other papers included in the dataset give really original and precious contributions to the topic.

3.2.3 Highlights from the literature

Analyzing the literature allows to define three domains/layers of platformisation within the Mobile Services domain (Ballon, 2009):

- **OS embedded in the devices.** Platform strategies have been devised to deal with development costs and rapid innovation cycles. The beginner was *Symbian* that offered facilities like SDKs, APIs and other documentation to independent developments, trying to create a sort of "Symbian Economy". Subsequently new OS came to light. Among them, the most important are *iOS* (developed by *Apple* and strictly bundled to the *iPhone*) and *Android* (developed by *Google* that made it available to several device manufacturers). Both of them have been adopting an approach similar to *Symbian* that is paying off. As a result of this platform completion *Symbian* is no more the leading OS: it was dethroned by *Android* that became the world's best-selling smartphone OS platform in Q4 2010 (Lunden, 2011c). Even *Nokia*, *Symbian* biggest supporter, moved to another platform: *Windows Phone 7* (Lunden, 2010c; 2010b; Arthur, 2011).
- **Service management.** The idea is to introduce a number of horizontal 'planes' on top of the network layer, containing several services and service components that can be used and re-used at will. An example is *IMS*, a set of standards (developed by 3GPP, IETF[88], etc.) to function as an overlay network enabling voice and multimedia communications over IP networks.
- **Web-based services.** Platform strategies evolve around browsers and widgets, with the idea of developing a number of features for mobile search and mobile location as main components. For example, developing its OS, *Google* aimed at guaranteeing advanced browsing capabilities. Another area of interest is social networking applications, where platform strategies aim at gathering very large user communities that generate huge amounts of profile data, as well as attracting large amounts of content providers and advertisers. For example, *Facebook* has developed the *Facebook Platform*, allowing third-party application development for its site, using very easy development language.

This classification gives just a raw overview on the Mobile Services platforms. Therefore it is interesting to analyze different business models adopted by actors operating in this domain (3.2.3.1). Then a more specific focus on possible scenarios for Mobile Operators has to be taken into account (3.2.3.2). To conclude some observations about the platform leadership (3.2.3.3) and the Open Platform (3.2.3.4) concepts are made.

[88] Internet Engineering Task Force. www.ietf.org.

3.2.3.1 Business models for the Mobile Services platforms

Combining actors and roles, four possible Mobile Services platform architectures emerge[89]:

- **Telco-centric model.** The majority of roles is carried out by the Mobile Operator (i.e. *Vodafone*, with its platform *Vodafone Live*!), who acts as Portal Provider (user accesses services via a portal), Platform Operator, Service Aggregator and Network Operator. This single business entity plays a crucial mediating role between the Users and the Service Providers. The latter can be exclusive partners of the Mobile Operators, facing high dependency (de Reuver, Visser, Guillermo, & Bowman, 2010), or be third parties.

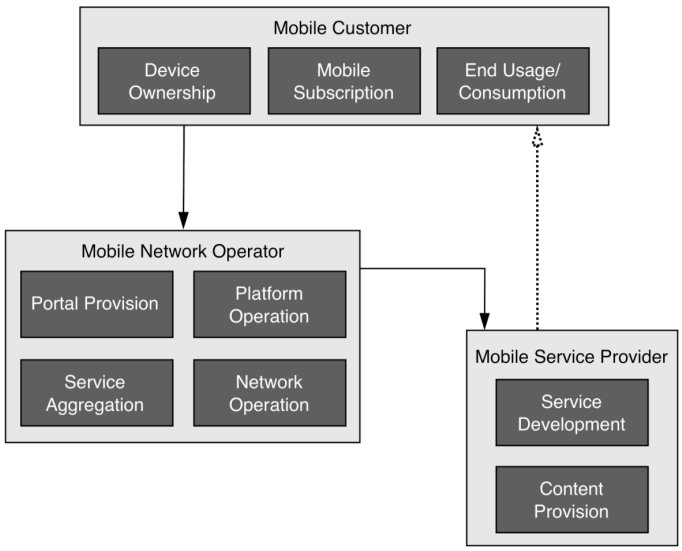

Figure 50 Telco-centric Model. Actors and roles. (Ballon, 2009)

The Operator who plays this pivotal role hopes to attract as many Service Providers as possible by negotiating a control (revenue sharing contracts are nowadays widely used), offering access to its customer base as well as internal know-how (i.e. proprietary service development procedures, etc.). (Ballon, 2009) Therefore Service Providers' flexibility is limited as they have to meet Operator's guidelines and specifications. In addition such platforms are likely to be determined by industry-wide agreements, and thus hardly flexible. Moreover, being users quite reluctant to spread around personal data, Operators can be perceived as a trustable entity. From the other side, users' flexibility is reduced because the Operator chooses which services/applications are available. (de Reuver, Visser, Guillermo, & Bowman, 2010)

- **Device-centric model.** The main service platform is incorporated in, or tied together with the mobile device (i.e. *Apple*'s *iPhone*). The Device Manufacturer functions as Portal and Platform Provider too, choosing and controlling which services are made available to consumers as well as

[89] Some guidelines to interpret the models: black arrows refer to financial transactions; dotted arrows indicate the service "flowing" back to the users.

providing information[90] and tools to develop services and applications for the devices.

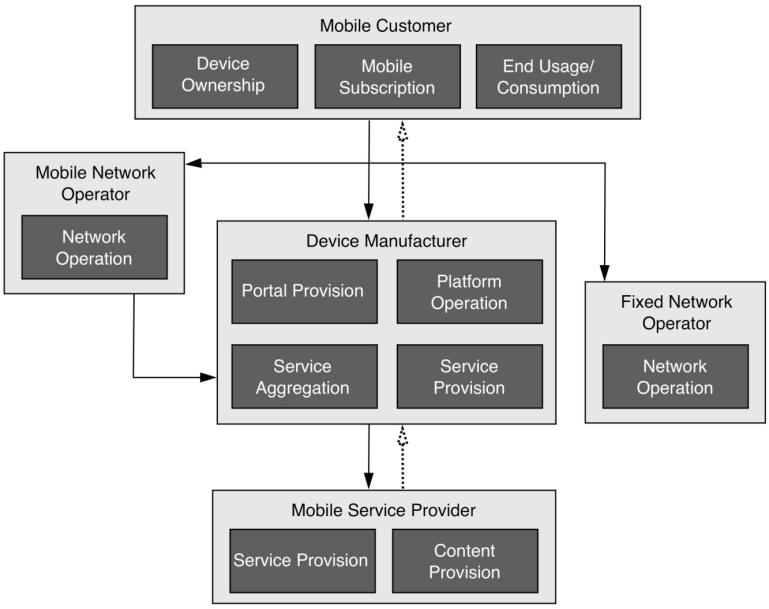

Figure 51 Device-centric Model. Actors and roles. (Ballon, 2009)

The device can be linked to a specific Mobile Operator (i.e. through a contract or a specific SIM card) as well as be open, allowing users to choose the Mobile Operator. The Mobile Operator can still maintain relations with Service Providers and Aggregators to develop services for the devices.

From Service Providers' point of view, flexibility is low as there are several OS (and consequently several SDK) forcing them to make their services available to multiple platforms (that can be open-source, as *Android*, or proprietary, as iOS[91]): this implies duplication of programming efforts, etc. User-side flexibility is low: despite that they have more control over their data and services, in case they adopt close systems (such as *iPhone*) serious limitations in changing programs settings, etc. (de Reuver, Visser, Guillermo, & Bowman, 2010)

- **Aggregator-centric model**. The function of Portal Provider is taken over by the Service Aggregator (i.e. *Facebook Mobile*). It serves as a portal to the Users, who can install several smaller applications basing on personal interests/preferences. The Service Aggregator plays the Platform Operator's role too, by defining a language in which applications have to be developed, hosts the services, etc. The Network Operator is paid by the user to gain access to the portal, which is anyway not bound to a specific network. Service Providers are confined to the platform the portal uses to deliver the services even if, in some cases, users can access services both with and without the mediation of the portal.

[90] i.e. with a Service Development Kit.
[91] The Operating System developed by Apple for iPhone and iPad.

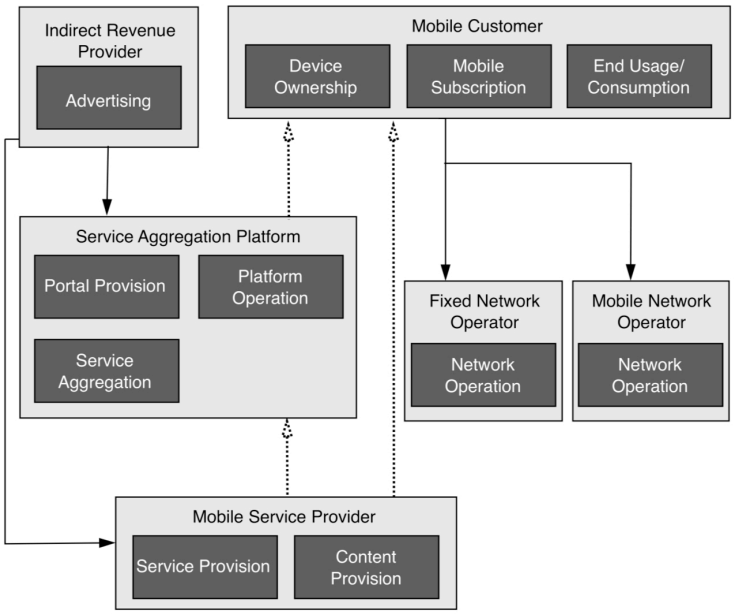

Figure 52 Aggregator-centric Model. Actors and roles. (Ballon, 2009)

This model offers considerably more freedom to Developers regarding the applications they create but retains a proprietary edge when considering the single development platform that Service Providers have at their disposal and the control over personal data by the Platform Provider.

- **Service-centric model.** Services become platforms by themselves (i.e. the plans and models surroundings *Google Open Social Initiative* concerning open APIs for social networking applications). The user connects via the Operator (that ensures just Broadband Access Services) and selects the services he wishes to subscribe to. The selection of these services can or cannot be facilitated by a Portal Provider. The role of Platform Operator partially resides with the Service Providers, regarding hosting, dealing with potential third party companies. The Metaplatform Operator is involved too, offering a container API, which allows developers to link different services together, exchange profile information, etc.

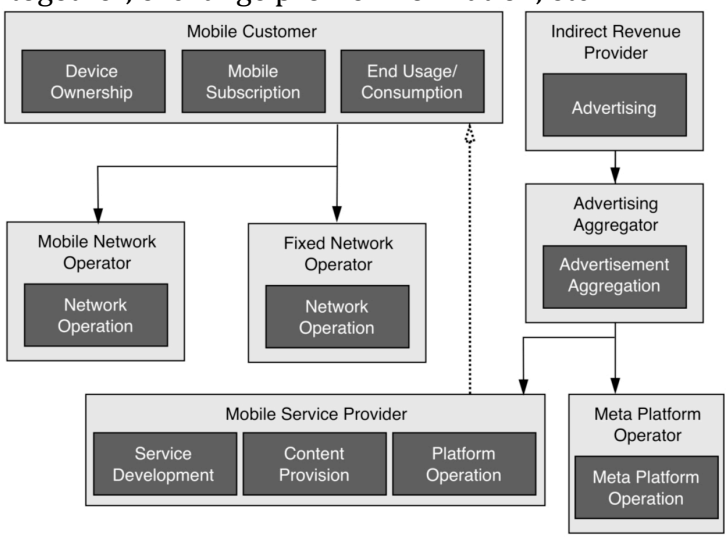

Figure 53 Service-centric Model. Actors and roles. (Ballon, 2009)

This model is mostly theoretical, adapting the open access Internet model to the mobile environment and providing Service Developers with maximal freedom to choose a development platform. Therefore their flexibility is high, despite it is not clear how revenue models will play. On the other sides, users may experience a lack of flexibility as they need to enter their personal information as well as charging/billing data for each new service. (de Reuver, Visser, Guillermo, & Bowman, 2010)

3.2.3.2 Scenarios for the Mobile Operators

Goncalves, Walravens & Ballon (2010) propose four scenarios to classify platforms, looking at the level of control over assets and over customers:

	No control over Customers	Control over Customers
Control over Assets	Enabler Platform	System Integrator Platform
No control over Assets	Neutral Platform	Broker Platform

Source: **(Goncalves, Walravens, & Ballon, 2010)**

Table 9 Typology of Platform Models

- **Enabler**. The platform owner controls many (or most) of the assets involved in mobile service provision, leaving the customer relationship to third-party developers. Two are the possible scenarios for the Mobile Operators:
    - Facilitating an ecosystem to support the entire software life cycle by offering the underlying services for application design, development, testing, deployment and hosting (i.e. *Telefonica*'s initiative with *Open Movilforum).*
    - Facilitating an environment for development and integration with their assets, but deployment and hosting is left to application developers (i.e. *Telenor*'s *Content Provider Access*).

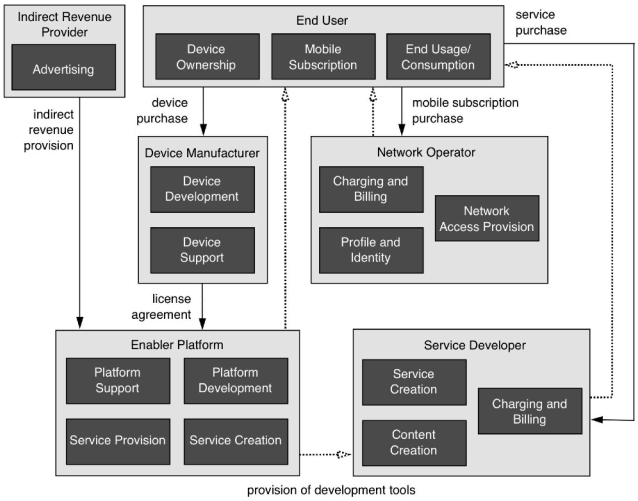

Figure 54 Enabler Platform (Goncalves, Walravens, & Ballon, 2010)

- **System Integrator**. Many or most of the assets related to the value proposition (as well as the customer ownership) are in hands to the Platform owner (which allow competing service providers to use its

platform) in order to increase the value of both this platform and its own end-user service offering. Besides what encompassed in the enabler platforms, Mobile Operators also offer a branded marketplace where developers can publish applications in order to reach end-users. Thus the Operator also holds the direct commercial relationship with the end-user through micropayments or the current billing system. An example is *Orange Partner:* the Application Developers community by *Orange* (UK´s second biggest Mobile Operator).

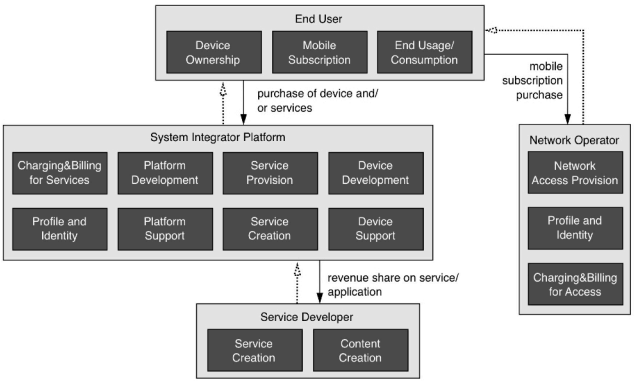

Figure 55 System Integrator Platform (Goncalves, Walravens, & Ballon, 2010)

- **Neutral**. The Platform owner does not control most of the assets necessary for the value proposition and does not have customer ownership. This model usually takes the form of a consortium of Mobile Operators (in some cases including hardware manufacturers, software companies, etc.) cooperating to develop a specific standard or technological advancement (i.e. *Joint Innovation Lab* and *Linux Mobile Foundation*).

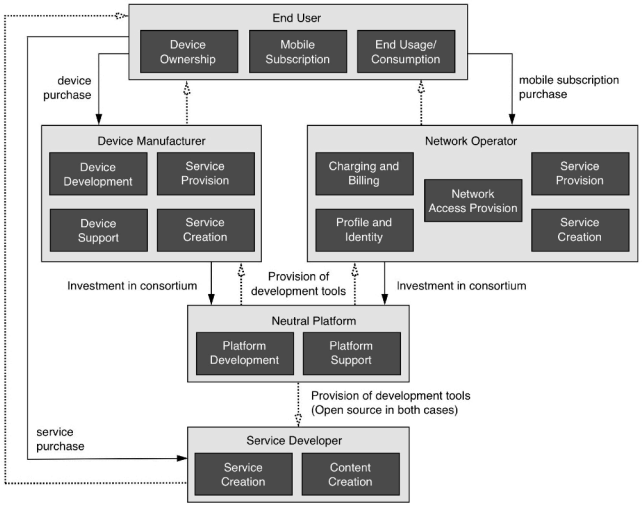

Figure 56 Neutral Platform (Goncalves, Walravens, & Ballon, 2010)

- **Broker**. The platform integrates customer ownership but relies on other actors that control most of the assets for establishing the value proposition. For the Mobile Operators, it implies to offer a marketplace where mobile software can be downloaded to end-users' devices. An example is *Vodafone*'s *App* and *Extra*'s storefront (for more details, see 5.1.2).

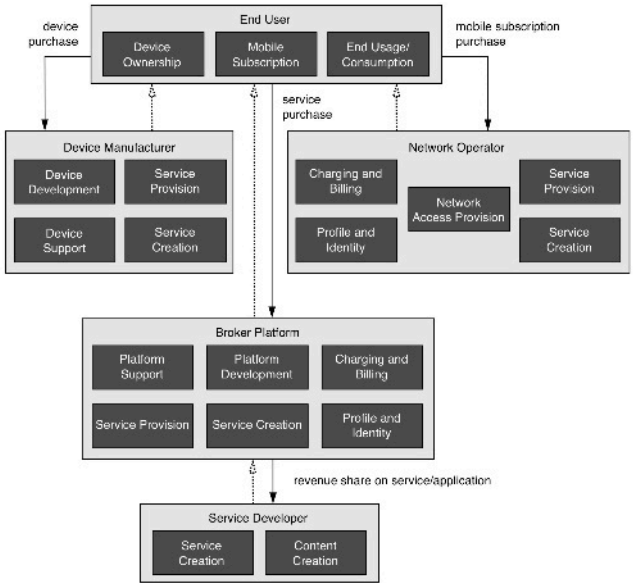

Figure 57 Broker Platform (Goncalves, Walravens, & Ballon, 2010)

Core competencies for each platform are summarized in the following table.

Platform Type	Competences
Enabler	Building and maintaining an IT infrastructure. Supporting developers in developing and submitting software. Setting attractive pricing for developers. Developing skills in a different type of customer support. Involvement in standardization activities. Induce innovation by incentivizing developers.
System Integrator	Enabler platform competences and attracting: - Developers, by setting up an attractive revenue share rate and a good development platform with possibility for feedback. - End-users, setting up competitive pricing and billing schemes.
Neutral	Being organized and structured to facilitate efficient collaboration. Managing relationships and balancing the internal and external interests of partners. Setting up B2B relations to create platform awareness.
Broker	Attracting: - Developers, by providing incentives to publish on the platform (e.g. an attractive revenue sharing scheme) and tools to track statistical information on their products. - End-users, by focusing on user experience and providing a user-friendly environment at competitive prices.

Source: **(Goncalves, Walravens, & Ballon, 2010)**

Table 10 Core competencies for platform type

3.2.3.3 Platform leadership

The Open Mobile challenge has pushed the emergence of dominant platform leaders (Deloitte, 2009). Platform leadership refers to the strategic objective to **control a central system module** around which other companies may develop a range of complementary technologies and products. The importance of this concept is given by the fact that it takes into account the need to exercise a form of control over complementary products, services and components as well as reaping the benefits form a strategy aimed at fostering network effects. Platform leadership can be conceptualized as the strategy to transform the operation of a technological platform into the control of a platform in the business or economic sense. (Ballon, 2009)

Gawer & Cusumano (Ballon, 2009) identifies four levers for a platform leadership strategy:

- **Scope of the firm.** Deciding what to make inside and what to leave to external firms is the most important decision because it determines whether a thriving ecosystem of complements will come into existence (thereby rendering the platform more valuable). The company should try to keep in-house the capability to venture into the complementary areas in the future for the following reasons:
    - Retain the expertise to define the interface between its product and complements.
    - Ensure that the platform leader has the ability to enter the complementary market directly, in case that outside firms decline or fail to.
    - Safeguard the platform leader's bargaining power with the complementors.
- **Product technology.** High-level design of the system and the interfaces determines how components or subsystems work together and can have a profound and lasting impact on the structure of an industry. Adopting a modular architecture is the ideal approach to system design for those platform leaders that want to take advantage of third-party innovation. Open disclosure of interfaces and IPR[92] is highly debated inside the companies: despite disclosing full product information generates a kind of "turbo effect", most of the platform leaders jealously guards internal specifications and core IPR.
- **External relationships.** Companies have to find a strategy balancing consensus (among key complementors, regarding technical specifications and standards), control (over critical design decisions at other firms), collaboration and competition (because platform leader's and complementors' future depends on how well these firms cooperate).
- **Internal organization.** The above mentioned balancing act may require that some internal groups are focused on competition with other companies, while other groups' focus is on cooperation with partners.

[92] Intellectual Property Rights.

Moreover platform leaders need their own culture, which includes adopting systemic and neutral mindset that extends to the entire industry.

For identifying who controls the central system module, Ballon & Walravens (2008) use the term **Platform gatekeeper** as an extension of information gatekeeper, which is commonly used in media and information theories to describe persons and organizations filtering and packaging ideas and information. Within the Mobile Service domain, a platform gatekeeper carries out the following roles:

- **Service Creation environment**: defining a set of development and hosting tools for third-party service developers.
- **Profile/identity management**: handling general user data and user preferences for various services and user preferences for multiple user situations.
- **Service provisioning/brokerage**: representing the reference point for end-users to retrieve, subscribe and use services and service components.
- **Charging & Billing**.

An actor exercising all or most of these gatekeeper roles is likely to be vying for platform leadership and dominance within the ecosystem. This strategy includes:

- Fostering a thriving ecosystem of external complementary innovators.
- Influencing architectural design through open interfaces combined with core intellectual property assets.
- Balancing consensus and control strategies towards contributors of complementary innovations.
- Adopting a systemic and neutral mindset that extends to the whole industry.

3.2.3.4 Open Platforms

The Platform Provider is unlikely to have the resources or capabilities to provide all the useful applications and services that make platforms (such as the PC or the smartphone) so compelling for users. Hence, to allow their technology to become an **industry-wide platform**, companies generally must have a strategy to open their technology to complementors and create economic incentives (such as free or low licensing fees, or financial subsidies) for other firms to join the same "eco-system" and adopt the platform technology as their own. (Cusumano, 2010b) An **Open Platform strategy** envisages supporting innovation communities too, because dispersed networks of development partners (i.e. third parties) can reconfigure talent, resources and capabilities to serve and feed the platforms (Deloitte, 2009; Ghezzi, Renga, & Cortimiglia, 2009). Future platform leaders will predominantly develop shared open platforms, even if proprietary platforms will be present too, offering advantages when they can serve an entire market and large investments are required (Deloitte, 2009).

When is a platform open? When no restrictions are placed on participation (in its development, commercialization or use) or, at least, restrictions are reasonable and non-discriminatory (applied uniformly to all potential platform participants). For a given platform, each role (Demand-side user, Supply-side user, Platform Provider and Platform Sponsor, see 3.1) may be open or closed. Therefore, assessing platform openness requires evaluating all the four roles. (Eisenmann, Parker, & Van Alstyne, 2008)

At the technological level, **Open Source technologies** usage is predicted to spread throughout the industry and have stronger economic and strategic implications (Deloitte, 2009). Creation of anticipatory standards and common technical platforms are forms of open innovation (Grotnes, 2009) that lead to a commonly shared base of know-how. Looking at the specific case of the Application Stores, openness and independence granted by a "self-publishing model" that offers tools to create applications, publish them on the store, govern retailing policies concerning prices and presentation, etc. (Ghezzi, Balocco, & Rangone, 2010).

4 Methodology for the empirical analysis

The previous chapters develop a strong theoretical background to build the value network model. This background is extremely valid but it has to be complemented with an empirical investigation that looks at Operators´ actual challenges in their market and encompasses real-life examples. Coupling together these two elements is essential to build a solid base for the value network model.

To achieve this goal, the empirical investigation has to be meaningful for the model and well structured. Therefore it is crucial to look at the main objectives of the analysis (4.1), which is the chosen sample of case studies that are analyzed (4.2), how a case study is structured (4.3) and how the interviews have been released (4.4).

4.1 Objectives

Developing an empirical analysis based on case studies allows finding confirmations about what discovered investigating the literature and connecting the main contents with real-life strategies. More specifically, this part of the research aims at:

- Finding common patterns among different Mobile Telecommunications markets in Europe.
- Having a more detailed view on Operators' actual problems (i.e. drop in mobile ARPU, see 1.3).
- Understanding how Operators are working to update their networks to meet the growing demand for higher data-rates.
- Looking at Operators´ strategies regarding Mobile Services platforms and similar initiatives.
- Investigating other strategies (besides platforms adoption) Operators have to diversify their revenues.

4.2 Case studies: the sample

Figure 58 Case studies

To keep the Operator-centric perspective, a proper sample of European Mobile Operators has been chosen. The first part of the sample is composed by the four Mobile Operators operating in Italy:

- ***TIM***, see 5.1.1.
- ***Vodafone Italia***, see 5.1.2.
- ***Wind***, see 5.1.3.
- ***Tre Italia***, see 5.1.4.

This sample allows having a complete overview on the Italian market as they together account for the 96% of the market share in the country.

These case studies are developed with secondary and primary data. Regarding the former, the following sources were explored: leading business newspapers (i.e. *The Financial Times, The Wall Street Journal*), online news aggregators (i.e. T*elecompaper*, *mocoNews*) and Operators´ press releases.

Regarding the latter, several interviews with the top management team of the Operators have been released. More details can be found in the table below.

Operator	Interviewee	Job title	Date
TIM	Egisto Benelli	Vas Marketing Director	12/04/2011
Vodafone Italia	Alessandra De Carlo	Head of Marketing Mobile Data	05/04/2011
Wind	Stefania Carra	Head of VAS Marketing and Business Development	13/04/2011
	Alessandro Lavezzari	Head of Internet Mobile Consumer offering	13/04/2011
Tre Italia	Roberto Forte	Broadband, VAS & Portal Director	14/04/2011

Table 11 Interviews with the Italian Mobile Network Operators

Looking just at the Italian market is quite limitative as the investigation aims exploring the whole European context. Therefore the above-mentioned case studies are coupled with others, involving major European Telecommunications groups:

- ***Telia***, headquartered in Sweden, this Operator is particularly interesting to be analyzed because is the first in the world to launch 4G services and have a wide presence all over Europe (see 5.2.1).
- ***Telenor***, headquartered in Norway, this group has been growing tremendously for the last years. Sweden is among its most important markets, where it launched 4G data services as well (see 5.2.2).

Even these two case studies are developed using both secondary and primary data. Regarding secondary data, the same sources listed before have been used here too with additional contributions from some national newspapers.

Focusing on primary data, one interview has been released with a top manager working for a Mobile Operator active in the Scandinavian market. For specific will of the company, no details can be released in this report. Therefore the name of the company and the name of the interviewee are kept anonymous. Nevertheless it is important to point out that this interview has a great value too as it has been used throughout the investigation to identify common pattern between the Italian market and other markets in Europe.

To sample is completed by the ***Wholesale Application Community*** (WAC, see 5.2.3): an interesting initiative (headed by many Mobile Operators on a global scale) that aims at developing common standards for Mobile Services platforms to encourage open standardized technologies, drive scaled deployment of these technologies and provide complementary commercial models. To develop this last case study just secondary data are used.

4.3 Structure of the case studies

The case studies on Mobile Operators (*TIM*, *Vodafone Italia*, *Wind*, *Tre Italia*, *Telia* and *Telenor*) are organized to be as useful as possible to develop the value network model. Therefore the following structure is followed:

- **Company overview**. This introductory part aims at having a better understanding about the company, its origins and its operations.
- **Financial and operating overview.** The focus of this part is about offering a financial and operating (looking mainly at Mobile AMPU[93] and ARPU[94]) overview of the company to have a better and more quantitative understanding about how Operators' profits are threatened (see 1.3).
- **Network development**. The most important initiatives to roll out 3G and 4G networks are here explored, as key success factor for new and sophisticated mobile services.
- **Mobile services platforms**. This part explores Operators´ most important projects within the Mobile services platforms area.
- **Other challenges**. This last section gathers together all the other interesting initiatives headed by Operators that are relevant for the value network model. Examples are mobile payment solutions, collaborations with other actors within the mobile services domain, etc.

Due to its different nature, the case study about the *Wholesale Application Community* is organized in a different way. After defining the goal of the initiative and the companies joining the project, more details are offered about Operators´ plans to implement the guidelines of the platform.

[93] The term Mobile AMPU stands for Average Minutes Per User: the amount of time (measured in minutes) the average subscriber talks (or listens) in their phones.
[94] The term Mobile ARPU stands for Average Revenue Per User: the total revenue divided by the number of subscribers

4.4 Structure of the interview

The interview is divided into two parts: the first one aims at finding confirmations to what stated in the problem setting phase (see 1.3). The second one explores some possible solutions to these problems.

4.4.1 Part I: understanding Operators' problems

1. Mobile ARPU has been dropping for the last years. From 2007 to 2010, the drop has been about 20% (EU average).

   How are Operators reacting to this trend? Is there a possible way out to invert it?

2. The previous phenomenon is coupled with an explosion of data traffic. To deal with this trend, the Operators have to heavily invest in network infrastructures (i.e. LTE technologies), spectrum, etc.

   In which ways these investments can be considered as an opportunity to grow and innovate or rather a necessary step to survive in the market?

   Practical issues:

   - Consumers: LTE phones / Internet key / customer adoption / opportunities for new services / etc.
   - Operators: bands, time / cost to realize the network, etc.

3. These two trends put a lot of pressure to Mobile Operators. The ways out might be different:

   a. Many Operators are planning to charge Content Providers (i.e. *Google* for *Youtube*) for guaranteeing high-quality delivery of their services to end-users. These services are seen as the main responsible of data explosion.

      What do you think about this initiative? Does it solve the problems or is it just a mere reaction to gain some time?

      Practical issues: Is it actually possible, net neutrality, Telia's iniviatives for video services (on-demand, real-time), etc.

   b. Another way is to charge high premium fees for 4G data services.

      What do you think about this initiative? Is it feasible in a long term? How long?

      Practical issues: Plans (flat, semi-flat, per-use), etc.

   c. One more option can be to differentiate the mobile services portfolio and include contents, advertising, etc. Past experiences with Mobile Portals (close systems controlled by the Operators) were not successful. Now the Application Store (open to developers and users) paradigm has exploded and might allow Operators to make another try.

      What do you think about this idea? Which are pros and cons from an Operator's point of view?

      Practical issues: Initiatives in the past, present and future.

4. New players in the competitive arena (i.e. *Apple*, *Google* and *Facebook*) might compromise Operators' relation with end-users.

   Do you see any imminent threat? How can Operators defend their position?

   Practical issues: Can social networks substitute SMS usage?, etc.

5. SIM cards are the main assets Operators have to control their customers. Indeed SIM cards hold a lot of precious information (i.e. customer profile and position) that can be a dormant revenue opportunity for Operators.

   How do you see the role of SIM cards evolving in the next years?

4.4.2 Part II: finding possible solutions

6. As stated before, Mobile Services platforms may be a strategic tool to differentiate mobile services by encompassing contents and applications. Imagine that an Operator is planning to develop a platform.

   Which would be its main strengths and weaknesses?

7. Let's consider the competitive arena where the Operator is planning to develop the platform. Location-based (context-aware) services and mobile advertisement might be two good opportunities Operators can catch.

   Do you think context-aware advertisement will be relevant in the future? How can Operators play a relevant role within this scenario?

   Practical issues: Initiatives, privacy problems with users, etc.

8. Many Operators (among them Telenor) are joining their efforts to develop an industry-wide platform initiative: *Wholesale Application Community* (WAC). The idea is to create joint storefront to encourage open standardized technologies. First consequence: applications developers' life will be easier (no specific developments for every platforms). Second consequence: operators will access to WAC contents catalogue to build their own store (software developed by Ericsson).

   Have you heard about this initiative? If yes, what do you think about it (eventually list some pros and cons)?

9. To conclude let´s focus on the opportunity to offer billing services to interested parties.

   How strategic is their billing platforms in this context? Which are Operators' revenue sharing opportunities in this area?

   Practical issues: Billing for mobile services (even for external platforms), mobile payment initiatives, etc.

5 Case studies

The chapter is organized as follows. First the four Mobile Operators (*TIM, Vodafone, Wind* and *Tre*) are analyzed (5.1). Subsequently, the other case studies (*Telia*, *Telenor* and the *Wholesale Application Community*) are explored as well (5.2).

Every case study follow the structure before defined (see 4.3).

5.1 Italian case studies

The sample consists of all the Mobile Operators active in the Italian market: *TIM* (5.1.1), *Vodafone Italia* (5.1.2), *Wind* (5.1.3) and *Tre Italia* (5.1.4), here ordered by the market share (see 2.1.1).

5.1.1 TIM

Figure 59 TIM's logo

TIM is the Mobile brand of *Telecom Italia Group*, the largest Italian telecommunications company, also active in the media and manufacturing industries. It was founded in 1994 by the merger of several state-owned telecommunications companies. The most important one was *Società Italiana per l'Esercizio Telefonico* (known as *SIP*), which was the private-owned monopoly telephone operator in Italy.

Now it is a private company listed on the Italian stock market. The group operates landline telephone services in Italy, GSM mobile phone services in Italy and Brazil through its *TIM* subsidiary (*TIM Brazil*), and DSL internet and telephony services under the brand *Alice* in Italy and San Marino. It also owns a stake in *Telecom Argentina* and, therefore, it is present in Argentina (fixed and mobile operations) and Paraguay too (mobile operations). *Telecom Italia* also controls one of the main Italian television companies, *Telecom Italia Media*, and owns *Olivetti*, the manufacturer of computer peripherals and other hardware.

Looking at the M&A operations during the last year. *Telecom Italia* has been really active refining the synergies with *Telefonica*, its main shareholder. The group has strengthened its presence in Argentina taking control of 58% of *Sofora*, the holding behind *Telecom Argentina* (Sideri, 2010). Moreover the group has abandoned Cuba by selling its share of *ETECSA* (Telecom Italia, 2011a; Telecom Italia, 2011b).

TIM was founded in 1995 and acquired by *Telecom Italia* in 2005. It is one of the founders (together with *Orange* and *T-Mobile*) of the *Freemove Alliance* in 2003. The member, joined by *TeliaSonera* in 2006, can guarantee simple roaming services by distributing the world into geographical areas, each with a single rate for calls made and received during overseas roaming and for international calls made from the country of origin. This means the costs are independent from the mobile phone network used, and this transpires in the especially convenient rates charged.

5.1.1.1 Financial and operating overview

Focusing just on *TIM*'s the domestic market, at the end of 2010 the Operator has 9.1 million broadband accesses, 3.8 million broadband consumers (Internet keys and Mobile Internet through smartphones) and 31 million mobile lines (Telecom Italia, 2011d). It is the market leader in Italy, having the highest market share for both voice (39,8%, see 2.1.1) and data services (38%, see 2.1.1). Despite this position, it has the lowest 3G coverage (83,8%, see 2.1.2). On the wholesale market (dominated by *Vodafone*) the Operator hosts just 26% of the MVNOs (see 2.2.2).

Revenues from Mobile Services dropped by 8,3% during 2010 (Figure 60), worse than the market average that is set at -2,9% (see 2.1.1). More precisely, revenues from data services were substantially stable (+1,2% against a market average of +6,6%, see 2.1.1), revenues from voice services decreased consistently (-11,6%, worse than the market average that is -6,3%, see 2.1.1).

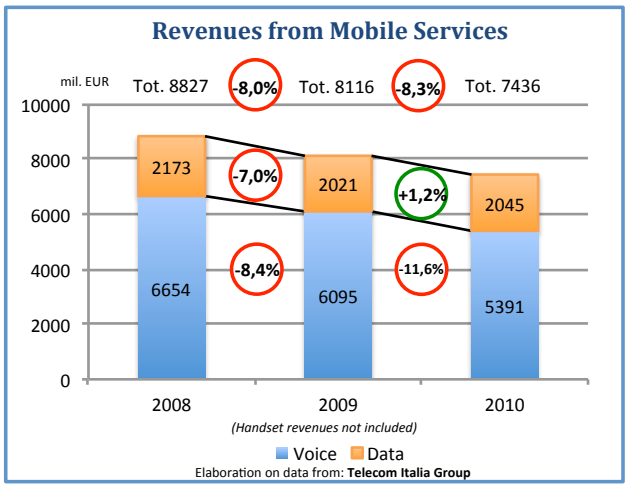

Figure 60 TIM's revenues (2008 – 2010)

Its major rival (*Vodafone*) performed better as revenues dropped just by 2,1% during 2010 (see 5.1.2.1). Moreover *Vodafone's* revenues from data services are performing very good (+7,3% against +1,2% by *TIM*). The main reason is that **Mobile Internet** has not exploded as for other Operators: *<<We have been experiencing a increase in users numbers but their usage is still weak>>* (Benelli, 2011); this trend can be explained by the characteristics of *TIM´s* customer base (who is not as young as *Vodafone´s*) and by the fact that the Operator has not pushed so much on smartphones (as *Vodafone*). Referring to the Internet key segment, *TIM* has performed pretty bad, passing from 36% (June 2010) to 33% (February 2011).

Traditional **mobile contents** are a troubled area as well: *<<2010 has been characterized by a decline, even if in the last months of the year this decrease has been slowing. This result is confirmed by the first months of 2011>>* (Benelli, 2011).

Looking at the KPIs made available by the Operator, it is interesting to comment how the Mobile ARPU and mobile usage have been evolving for the last years. The former has been dropping consistently starting from 2010 Q2 (about 20,6 EUR) to 2011 Q1 (about 17 EUR). On the contrary, mobile usage has been growing stably during 2009 and 2010 (from 122 to 167 min/line/month) and has shown a contraction during 2011 Q1.

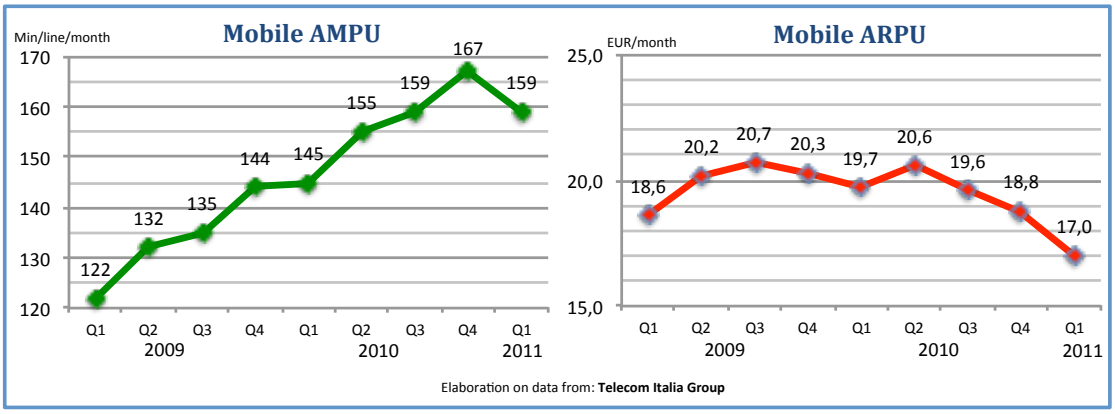

Figure 61 TIM's Operational KPIs

5.1.1.2 Network development

Looking at 3G networks, *TIM* is approaching HSPA+ technologies. The first cities to be covered were Rome and Milan (December 2010) where maximum data rate available is 21 Megabit/s. The plan for 2011 is to extend the network all over the country by the end of the year reaching data rates up to 43,2 Megabit/s. This service targets mainly business customers and will be made available to the mass-market afterwards. (Telegeography, 2010). Referring to future 4G adoption, *TIM* announced beginning of LTE tests in the center of Turin (LTE world, 2010) in August 2009. The Operator is to invest 8.7 billion a year between 2011 and 2013 (AGI, 2011). At the end of 2012 / beginning of 2013 the first LTE commercial offering should be launched (pianetacellulare.it, 2010). This information, despite being fragmented, is enough to state that *TIM* is likely to follow a path similar to *Vodafone* (see 5.1.2.2), as shown in Figure 62, which represented *TIM*'s plans updated at June 2011.

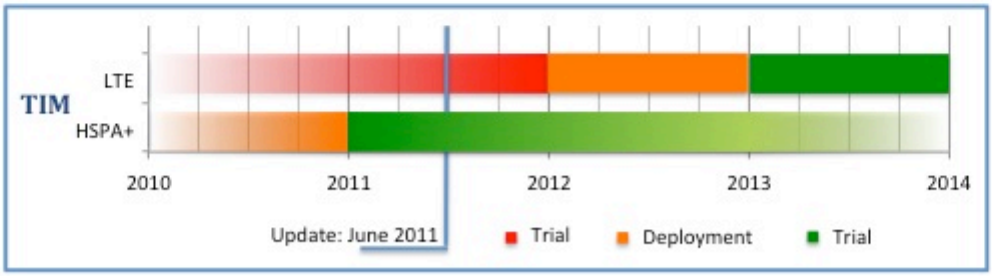

Figure 62 HSPA+ and LTE. TIM's plan

5.1.1.3 Mobile Services platforms

Talking about Mobile Services platforms, *TIM* has been the most active Italian Operator during the last six months. November 2010, it launched **TIM Store**, a brand-new Application Store developed in collaboration with *Telefonica* (Telecom Italia, 2010a). *<<This move aims covering that market segment that at the moment does not account for a big portion of our revenues but is the one that has the best growth rate>>* (Benelli, 2011). The store will be integrated with the stores operated by *Telefonica* (through its mobile brands *Movistar* and *O_2*) with the goal of creating a common application marketplace. April 2011, the store has been enriched with an **Application Manager** (Telecom Italia, 2011b): an open application market that aims to attain to all the promises behind the *WAC* initiative (see 5.2.3). *<< We are adhering to the WAC alliance. […] Our application store will adopt WAC standards, when ready>>* (Benelli, 2011). *TIM Store* innovates the concept of Application Store by having positive impacts on the following actors:

- **End-users**. User-experience is improved thanks to:
    - **Application portability**. Users will have access to both free and paid application. The true revolution is here: when users change their devices (and OS), they do not need to re-install all the applications but just the application manager as the application are stored on-line.
    - **Operator independence.** The store can be used even by users that have subscriptions with other Operators. Nevertheless, *TIM*'s users will be the only ones to be able to use their phone credit to buy applications: *<<TIM users can pay with their phone credit but our roadmap is to open this store even to users that have subscriptions with other Operators and allow other methods of payment>>* (Benelli, 2011). Users will be able to access the portal both via WAP (paying a small fee every time they connect) and both via Mobile Internet.
- **Application Developers**. The Operator will release a SDK to make application development easier. There is no need to develop different versions of the same application as the SDK guarantees compatibility with all the supported OS. *<<Actors providing applications on our platform are big B2B providers, Italian as well as international>>* but *TIM* is willing to attract *<< […] even smaller developers, with a developer program similar to the one by Android, Apple, Nokia, etc.>>* (Benelli, 2011). This is really helpful for those SME that do not have so many resources to develop multiple versions.
- **Operator**. Extra revenues can be obtained by:
    - **Revenue sharing contracts** with Application Developers (see 3.2.1.3). *TIM* estimates that revenues from applications will reach about two millions EUR in two years (Benelli, 2011).
    - **Advertisement**. Applications might host banners and other ads. Even in this case revenues can be shared with the Developers.

The Application Manager will be available for all the main OS with the only exception of iOS, as *Apple* has denied any kind of collaboration (Carli, 2011). The store is implemented by *Ericsson* but with some difference compared with the

white-label solution adopted by *Telenor* (see 5.2.2): *<< Telecom Italia and Telefonica have not chosen a white-label solution for their Application Store; the Operators have preferred a dedicated platform solution, developed by Ericsson>>* (Benelli, 2011). At the moment the most critical issue is the number of applications available: *<<We have about 1200 applications>>* and the goal is *<<to have 15-20000 applications by the end of 2011>>* (Benelli, 2011), far behind the 300000 applications available on *Apple´s App Store* (see 1.1.3).

Besides launching the *TIM Store*, the Operator has been working to update its old **mobile portal**, which has been suffering for the last couple of years: *<<After two years where accesses to our portal had continuously decreased, during 2010 this number stabilized at about 11 millions accesses (per year)>>* (Benelli, 2011). This trend is mainly caused by the increasing Mobile Internet usage that has cannibalized the old portal. Now the portal is completely re-styled to make its usage simple for end-users by reducing spaces both for branded contents and for contents developed by external actors. Moreover *TIM* has recently launched a new SIM card (*Smarty*) that allows showing SIM contents and applications in a way similar to webpages (Telecom Italia, 2011c).

5.1.1.4 Other challenges

During May 2011 *TIM*, *Vodafone*, *Wind* and *Tre Italia* (together with *PosteMobile* and *Fastweb*) launched a **common integrated payment platform** (De Carlo, 2011). This platform will allow their mobile subscribers to pay for digital contents on Internet (on and off-portal) using their phone credit on every device (feature phone, smartphone, tablet and PC).

According to a research by *PwC Advisory* (commissioned by the Operators) three are the important factors than can lead this solution to the success:

- Italy has one of the lowest credit card usage in Europe: about 90% of the transactions are still done cash (against the EU average that is less than 70%). Looking at the on-line transactions, most of them are done with credit cards and just 3,5 millions credit cards are used for this purpose. This platform enables a thirteen times bigger population to pay for digital contents on-line.
- Italy is one of the most advanced mobile Telecommunications markets in Europe (see 2.3), with high smartphones penetration and positive attitude towards mobile services. This creates a fertile ground for the diffusion of this solution.

Purchasing is handled in an easy and safe way: just one click is needed when the subscriber access merchants' website using his mobile phone; if the user is connected through a PC or tablet, he needs to insert its mobile number and a password. The platform has been developed by *Engineering* and *Reply.*

Among the first merchants interested in the initiative there are: *Gruppo Caltagirone Editore, Class Editori, Guida Monaci, Espresso, Il Sole 24 Ore, Microsoft Italia, Mondadori, Monrif/Poligrafici Editoriale, Paperlit, RCS, Shenker, L'Unione Sarda.* The biggest advantage for merchants is that they will be able to connect just to one common hub to reach all the mobile consumers, avoiding making singular deals with the Operators. *<<A similar system was launched in France. After three years revenues has reached about 100 millions of Euros, split among the Operators>>* (Benelli, 2011). Italian Operators aim achieving the same quota, expecting a boom during 2012.

Besides this initiative, *TIM* has been collaborating with *Nokia* since December 2010 allowing *TIM*'s subscribers to buy applications on the *Ovi Store* using the phone credit (Telecom Italia, 2010b). Egisto Benelli (2011) has highlighted the importance of this project for Operator's revenue sharing strategy: *TIM* takes 30% on every purchase done by its subscribers while the developer keeps the remaining 70% (therefore *Nokia* does not have revenues from these purchases). The executive also declared that this project would not be repeated with other application store (i.e. *Android Market*) as there are no good revenue sharing conditions for *TIM.*

Moreover *TIM*, together with *Orange UK*, *T-Mobile*, *Orange* and *Vodafone*, is working on spreading NFC-capable phones. *Orange*'s objective for the second half of 2011 is to increase NFC phones sales up to 50% of the total amount of phones sold by the Operator. (Guadagnolo, 2011b)

5.1.2 Vodafone Italia

Figure 63 Vodafone's logo

Vodafone Group was founded in 1984 as affiliated to the company *Racal Electronics Plc*., (at that time named *Racal Telecom Limited*). About 20% of the shares where offered to the public in 1998. In 1991 the company became independent from *Racal Electronics Plc*. changing its name to *Vodafone Group Plc*. During 1999 the company merged with *AirTouch Communications* and changed its name to *Vodafone AirTouch Plc*. During 2000 the old name (Vodafone Group Plc.) was re-established. Since then the Operator started its unstoppable growth.

Today is the world's largest mobile telecommunications company measured by revenues and the world's second largest measured by subscribers (behind *China Mobile*), with around 341 million proportionate subscribers as of November 2010. It is headquartered in London (UK) but it operates networks in over 30 countries and has partner networks in over 40 additional countries. It owns 45% of *Verizon Wireless*, the largest mobile telecommunications company in the United States measured by subscribers.

Looking at its operations in Europe, *Vodafone* is present in the following markets: Albania, Czech Republic, Germany, Greece, Hungary, Ireland, Italy, Malta, Netherlands, North Cyprus, Portugal, Rumania, Spain, Turkey and UK.

Focusing on the M&A operations during the last year, *Vodafone Group* left the French market by selling 44% of *SFR*, the second Mobile Operator in the country (Parker, 2011d).

The Italian branch of the group is *Vodafone Italia*, operator owned by *Vodafone Group* (76,86%) and *Verizon* (23,14%). The company was originally named *Omnitel Pronto-Italia* (shortly named *Omnitel*), which launched its services in December 1995 and was the first one to win the license to operate in the Italian market in 1994. *Omnitel* was a Mobile Operator and *Infostrada* (today owned by *Wind* group, see 5.1.3) was a fixed-line Operator: they both belonged to *Olivetti* and represented the first telephone alternative to monopolists *TIM* and *Telecom Italia* (see 5.1.1).

After taking control of *Telecom Italia* (and thus *TIM*), *Olivetti* sold its interest in *Omnitel* and *Infostrada* to the German consortium *Mannesmann* (which was a minority shareholder) after. Mannesmann took control of *Omnitel* with a 53.7% equity stake in 1999. The following year *Vodafone Group* purchased Mannesmann's stakes, thus taking control of *Omnitel*.

The Vodafone brand was introduced as *Omnitel-Vodafone* in 2001, made the primary brand as *Vodafone-Omnitel* in 2002; finally the current name *Vodafone Italia* was introduced in 2003. In 2007, like in Spain, *Vodafone Italia* has bought the Italian branch of *Tele2*, renaming later as *TeleTu* in 2010. With this strategic move the Operator started its first fixed-line network offers.

5.1.2.1 Financial and operating overview

The Operator has the second highest market share for both voice (36,5%, see 2.1.1) and data services (37,6%, see 2.1.1). It has a better 3G network coverage (85%, see 2.1.2) compared with the market leader *TIM*. *Vodafone* is the market leader on the wholesale market, hosting 32% of the MVNOs (see 2.2.2).

At the end of 2010, *Vodafone* has 30,4 million mobile lines in Italy (+0,7% compared with 2009). Pay monthly tariffs are gaining traction among consumer and business costumers (+12,5% compared with 2009). Messaging services have exploded during 2010 (+9,7%), pushed by promotions addressed to specific market segments ("*Infinity Messaggi Tutti*", "*1 Cent Messaggi*" and "*Zero Limit Smart*"). (Vodafone Italia, 2011c)

Focusing on the revenues from Mobile Services (Figure 64), revenues dropped by 2,1% during 2010 (market average -2,9%, see 2.1.1). Two are the important aspects to highlight: revenues from data services keep on growing (+7,3% against an average of +6,6%, see 2.1.1), reaching 29% of the total revenues from Mobile Services. On the contrary, revenues from voice services decreased by 5,1% during 2010 (market average -6,3%, see 2.1.1).

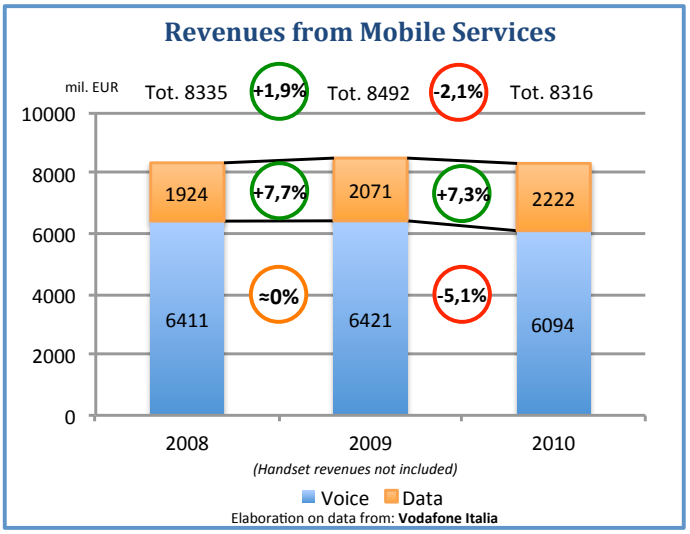

Figure 64 Vodafone's revenues (2008 – 2010)

5.1.2.2 Network development

Vodafone is the player that is experimenting the most in Italy. The Operator's 3G networks will reach data rates up to 43,2 Megabit/s in the sixteen biggest cities (Vodafone Italia, 2011a) and, within March 2012, in all the country (De Carlo, 2011). Another initiative to improve mobile broadband access services is *Vodafone booster*, which is going to be made available for testing to a limited amount of business customers (Vodafone Italia, 2011b). Moreover *Vodafone* is the only Operator to set a clear roadmap for LTE (Vodafone Italia, 2011a). The Operator began running tests over LTE networks in its Innovation Lab in Milan since May 2009 (LTE world, 2011). Afterwards it started a trial in the center of Milan (February 2010) and Rome (December 2010). Trials on over 200 sites are planned to take place during 2011. Extensive network deployment is set to take place during 2012. Vodafone will be ready for the commercial launch at the beginning of 2013. (Businessmagazine, 2011). All this information can be gather together to develop the chart below, in Figure 62, which represented *Vodafone*'s plans updated at June 2011.

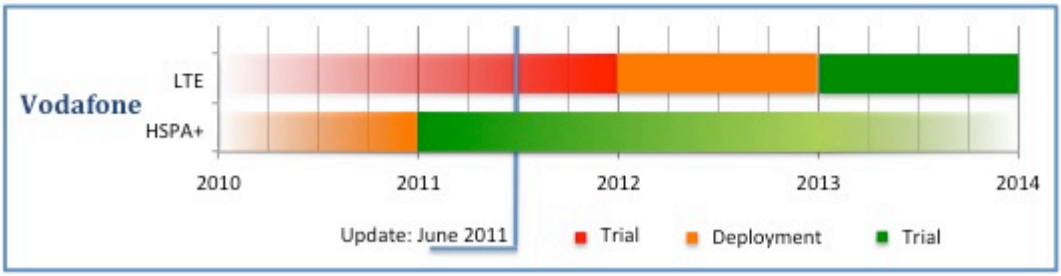

Figure 65 HSPA+ and LTE. Vodafone's plan

5.1.2.3 Mobile Services platforms

Vodafone Group has two global mobile services platforms initiatives: *Vodafone Live!* (since 2003) and *Vodafone 360* (since October 2009). The former is an "old-fashion" mobile portal (see 1.1.3) that gives access to both "on portal" and "off portal "contents and services. Most of these contents have to be paid for. Accessing this portal, end-users can download games, access to news and videos, connect to the *Vodafone Friends* community, activity SMS premium services (weather forecasts, etc.). There is also a Mobile TV service, which gives access to TV channels broadcasting football matches, etc. Moreover end-users can access to the service *Vodafone Music* to download songs on their device.

Despite other competitors (as *TIM*, 5.1.1.1), traditional contents available on *Vodafone Live!* are still performing good: *<< Traditional mobile contents are decreasing but they are still an important business area for the Operators. […] These contents have been adapted to new standards, more suitable for smartphones>>* (De Carlo, 2011).

Vodafone 360 is a mobile services platform designed for offering an advanced user experience for smartphone users. It has been active in Italy since October 30th 2009 as an attempt to retain the direct connection between Mobile Operators and consumers, which new devices (i.e. smartphones) have undermined by allowing users to download their own applications from third-party Application Stores, such as the *Android Marketplace*. At its core, there is an address book to group together contacts from different domains: device, social networks, IM and e-mail. Moreover end-users can download contents (applications, songs, videos, etc.) through a virtual shop, use a navigator integrated in the phone, share pictures with friends, etc. Going more into the details, the platform is organized in different sections, among which the most interesting ones are:

- *Vodafone App & Games.* The store is accessible via Vodafone's webpage and allows *Vodafone*'s users to download software for their specific device, as the store supports different types of hardware. Some of the software is available for free, others require a fixed monthly fee or a per- use fee. Overall, this platform is close to the Application Store paradigm shown before (see 1.1.3) and is an example of an MNO broker platform (see 3.2.3.2) as it offers third-party developed applications to Vodafone customers in a single environment (Ballon, 2009).
- *Vodafone Music.* This section gives *Vodafone*'s customers access to 6 millions of tracks & albums to purchase across the web & mobile. This service was launched in Italy in May 2011.

Integrating new initiatives with these pre-existent solution is crucial for the Operator: *<<It is crucial for us to integrate old and new services. […] We are currently developing a new "portal" for iPhone, a completely new proposition to substitute Vodafone Live! […]. There are a lot of applications developed by Vodafone to add value for its customers. Moreover the "portal" offers a set of widgets (weather forecasts, horoscope, etc.), links to contents (football, MotoGP, etc.) and MMS services […]>>* (De Carlo, 2011). The same idea will be replicated for Android-based devices and tablets with a richer value proposition, integrating games and music as well (impossible to do with *iPhone* as Apple already as its own *App Store* and *iTunes*

Store). *Vodafone Live!* will co-exist with these new initiatives and *<<[…] be offered for traditional phone users, simplifying the portal and making it lighter>>* (De Carlo, 2011).

5.1.2.4 Other challenges

One of the cornerstones of *Vodafone Italia*'s strategy is *<<[…] to have the best products portfolio>>* (De Carlo, 2011). **Smartphones** hold a crucial position to achieve this objective and it means *<<[…] having iPhone, Blackberry, etc. […] but also smartphones below 100 € […] to make them accessible to the mass market. Our strategy is horizontal […] having very few branded phones and focusing on offering a wide range of products from different manufacturers>>* (De Carlo, 2011). At the end of 2010, about 5.5 milions of smartphones are active on Vodafone's network (Vodafone Italia, 2011c).

Vodafone Italia has clear plans for **tablets** too: *<<We are planning to replicate this strategy with tablets too. […] Tablets have one feature more than smartphones: traditional media contents are going to be fashionable again, becoming an important reason-to-buy […]>>* (De Carlo, 2011).

Vodafone is looking at the opportunities offered by **location-based services**. Besides the above-mentioned Navigator (integrated in the *Vodafone 360* platform) the Operator is willing to offer positioning services just to few strategic Service Providers *<<We are willing to offer location-based services for very specific applications; […] for instance, we have recently released a free navigation application for iPhone. […] We prefer use these services in the domain where they have already been successful>>* (De Carlo, 2011).

Besides the cross-Operator **payment platform** above discussed (see 5.1.1.4), the Operator considers other **charging services** initiatives strategic. Indeed, besides its involvement in the above-described initiative (see 5.1.1.4), the Operator declared that *<< Our future is with cross-platform payment solutions. We want to enable our customer to buy items on different platforms in an easy way>>* (De Carlo, 2011).

Another interesting area where *Vodafone* is working is to introduce new **data price plans**. *Vodafone* is aware that *<< introducing pay monthly price plans in the Italian market is a losing battle, due to customers' mentality. […] Italy is a mature market and this is never going to change>>* (De Carlo, 2011). Therefore its strategy is to heavily segment the market and tailor price plans on these segments. Indeed *<<The time of charging data traffic per hour or gigabyte is over. […] People wants simple and easy-to-understand price plans. […] The new data plans we have launched guarantee a certain amount of data at a certain data rate on a monthly basis. When this quota is exceeded, the data rate is drastically reduced but customers can still surf>>* (De Carlo, 2011).

5.1.3 Wind

Figure 66 Wind's logo

Founded in 1997, *WIND Telecomunicazioni* (here shortly named *Wind*) is an Integrated Operator offering both fixed-line (using the brand *Infostrada*) and mobile services (using the brand *Wind*). It is active just in the Italian market but Operators using the same brand are present in Greece and Canada. The company was established by *Enel* (the Italian Electrical Company), *France Telecom* and *Deutsche Telekom*. In 2003 *Enel* became the only shareholder.

In 2005 the company was to *Weather Investments*, which merged with the Russian Telecommunications group *VimpelCom* in 2011. This operation (in which is involved even *Telenor*, which owns 40% of *VimpelCom*) gave birth to the fifth biggest Mobile Operator on a global scale. (Wind, 2010; Fi., 2011)

Looking at its fixed-line operations, in February 2001 *Wind* became the first alternative Operator of fixed-line telephony in Italy to provide access to local loop unbundling, offering the possibility to make fixed-line calls without the need to pay any form of line rental. The following year (May 2002) it was the first to launch Number Portability, enabling customers to switch operator whilst keeping their existing telephone number.

Focusing at its mobile operations, *Wind* was the first to launch MMS and video over GPRS handsets: one of the earliest services to be made available was the first ever pocket news broadcast via video streaming. Moreover it was the first in Italy to launch a trading on line service via WAP. During 2003 *Wind* signed a deal with the Japanese Mobile Operator *NTT DoCoMo* to launch mobile services based on the i-mode technology. *Wind* has been the only European Operator to use this system.

5.1.3.1 Financial and operating overview

Wind is the third largest Operator in Italy (after *TIM* and *Vodafone*), holding 13,5% of the market share for data services and 18,6% for voice services (see 2.1.1). It is the least active in the wholesale market, hosting 16% of the MVNOs (see 2.2.2).

Wind had a total of 19.9 million mobile telephone customers at the end of 2010, a rise of 8.2% over the same period of 2009, increasing its a market share to 22% from the 20.9% achieved in the fourth quarter of 2010. This performance had been pushed first by the seasonal "*Passa a Wind*" promotion, that gives new customers who apply for number portability a 50% discount on the monthly fee. The aim of this promotional strategy is to increase the interest of the customers of other operators in the services offered by *Wind*, gaining their loyalty by means of an automatic renewal offer and providing them with a price advantage linked to the customization of their tariff plan. Another aspect influencing the above performance was to propose beneficial tariffs to enable foreign residents in Italy to keep in contact with their loved ones throughout the world. In particular, tariffs were reduced in November and December for calls made to the principal destinations abroad with the "Call Your Country" option: Rumania, Albania, Morocco and Senegal. (Wind, 2011b)

At the end of 2010 the Operator has about 1,9 million mobile broadband clients. The key was to simplify the Internet on-consumption tariff. *Wind* introduced for all of its top-up customers a single on-consumption tariff based on connection time, thus removing the barriers relating to an understanding of service access costs based on data volume. Customers with frequent Internet use have continued to choose the options without time limit but subject to a fair usage policy under which an abuse of the Internet service envisages a significant slowing down of connection speed. This approach as already been illustrated for *Vodafone* (see 5.1.2.4) but it is important to point out that *Wind* was the first one to introduce it on the Italian market: *<<Unlimited data plans are a tool Operators have to control data usage>>* (Lavezzari, 2011).

Overall pulled by the growing smartphone diffusion, **Mobile Internet** is drawing more and more attention among *Wind*'s end-users: *<<Mobile Internet (Internet key and mobile broadband from devices) by Wind grew by 55% during 2010>>* (Lavezzari, 2011). This phenomenon has led to a data explosion, which has been driven by video services: *<<Video usage is increasing a lot. Data traffic generated by video services has doubled on our network during 2010>>* (Lavezzari, 2011). Looking at the Internet key segment, *Wind* has obtained outstanding performances in the last months jumping from 8% (June 2010) to 22% (February 2011).

Looking at the revenues from Mobile Services, *Wind* differs from other Operators. Indeed revenues have been growing since 2008 while other Operators in the Italian market (i.e. *TIM* and *Vodafone*) have shown a contraction. As shown in Figure 67, no information is available to distinguish between revenues from voice and data services.

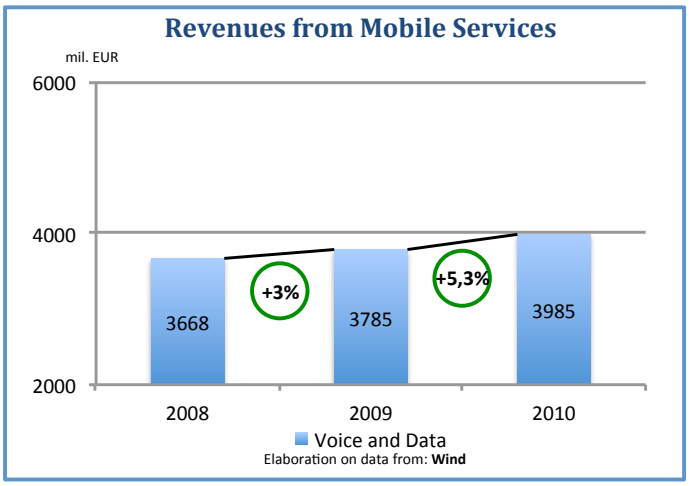

Figure 67 Wind's revenues (2008 - 2010)

Focusing on mobile usage on *Wind*'s network, it has been increasing consistently over the last two years (Figure 68). On the contrary, mobile ARPU has dropped (from 18,5 EUR/month at the end of 2008 to 16,6 EUR/month at the end of 2010).

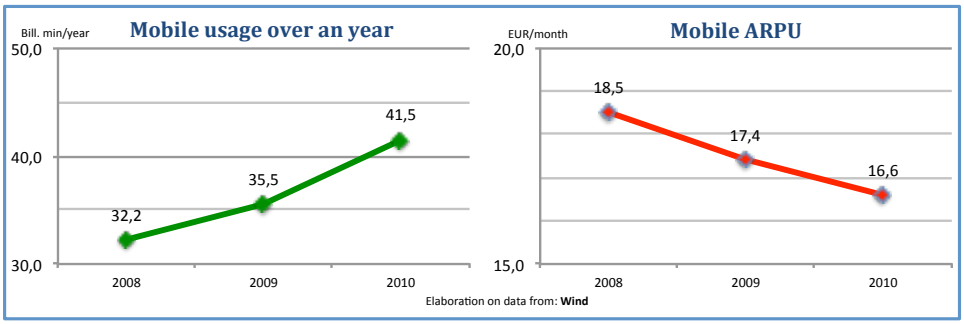

Figure 68 Wind's operational KPIs

5.1.3.2 Network development

Wind has closed a deal with the Chinese supplier *ZTE* in June 2010. This deal established a Joint Innovation Lab in Rome to deploy HSPA+ (and, in the future, even LTE) networks. (PuntoCellulare.it, 2010) Looking at the 4G roadmap, *Wind* is way behind *TIM* and *Vodafone*. The Operator began LTE tests in its Innovation Lab in Rome in June 2010 (PuntoCellulare.it, 2010). No other information is currently available therefore mapping *Wind*'s strategy graphically is almost impossible, as shown in Figure 69, in Figure 62, which represented *Wind*'s (undefined) plans updated at June 2011.

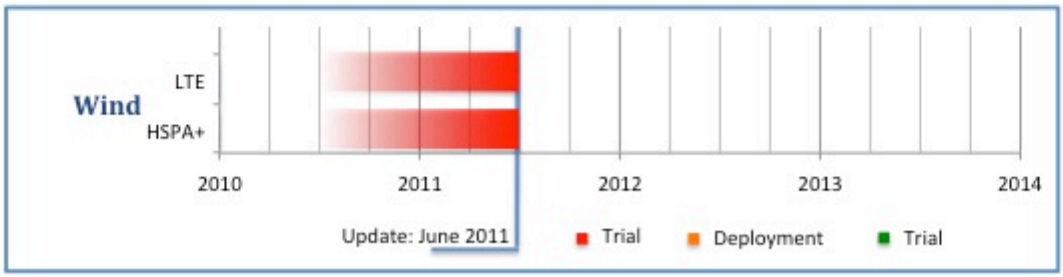

Figure 69 HSPA+ and LTE. Wind's plan

During the interview, the executive highlighted the following important aspects about network investments:

- **Band auctions**: *<<Auctions are expected to generate 2,5 billions Euros of revenues on the country´s budget [...] Therefore each Operator is expected to invest about 600-700 millions Euros for acquiring the licenses>>* (Lavezzari, 2011). Moreover he highlighted the correlation between network investments and band auctions: *<<LTE investments are correlated to which frequencies Operators will obtain with the auctions>>* (Lavezzari, 2011)
- **New codecs and algorithms** to optimize data traffic are one of the main focuses Operators' have to take care while evolving their network.

5.1.3.3 Mobile Services platforms

Wind has a WAP- and web-based mobile portal, which enables customers to buy ring tones and other options for their telephones and to browse a variety of websites, with various services such as news, sport and finance. In connection with its data and VAS offers, *Wind* works in close contact with suppliers of content and applications, such as for example *Mediaset*, *RAI*, *Dada* (RCS group) and *Zed*. These provide content using their own names and provide cross-operator services. The new version of the portal was launched in July 2010. As all the other Mobile Portals, *Wind* offers both on and off portal contents.

Besides the old Mobile Portal, Wind has other plans: *<<During 2011, we will launch an Application Store for Android branded by Wind>>* (Carra, 2011). Choosing *Android* is motivated by: growing market share (see 1.1.4), possibility (for the future) to obtain extra revenues (from revenue sharing contracts) by developing payment solutions for the store[95]. *Wind´*s store will have peculiar characteristics: *<<The idea is to promote some Italian contents and applications, certified by Wind, to help end-users to choose among the wide amount of applications available on the Android Market. […] We basically act as aggregators to help our customers>>* (Carra, 2011). *Wind* mobile subscribers will be able to easily access to this store directly from their devices: *<<We will install an application to access to the store in all the Android devices branded by Wind>>* (Carra, 2011). The Operator runs a Mobile Portal too (with about 10000 accesses per month) that *<<[…] is performing badly, being based on WAP technology. […] It is going to stop living soon>>* (Carra, 2011).

In addition the Operator has recently launched *Twitter® SMS*: a service to allow subscribers to receive friends' Tweets directly on the phone and to update their Tweets via SMS (Wind, 2011a).

[95] *Wind* has not signed any deal with *Google* yet.

5.1.3.4 Other challenges

Location-based services represent an interesting business area for *Wind* in the future. Indeed, despite the Operator does not have a proper offering of positioning service, it has ambitious plans for the future: *<<We are willing to experiment LBS services as well, taking care of privacy issues in the first place>>* (Lavezzari, 2011).

Besides the cross-Operator **payment platform** above discussed (see 5.1.1.4), developing **charging services** for third parties are considered among the top priorities at Wind. Indeed, besides the above-mentioned initiative (see 5.1.1.4), the Operator is evaluating opportunities on a wide scale: *<<Our billing capabilities allow us having partnership with several other actors. While the number of this partnership is growing, the percentage of revenues kept by the Operators is decreasing>>* (Carra, 2011). The Operator has ambitious plans: *<< By 2011, we are willing to extend billing services for most of the applications store, excluding Apple>>* (Carra, 2011) and it is particularly interested in the mobile ticketing area: *<<We are looking at mobile ticketing as possible area to develop our billing services >>*. Lavezzari (2011), stressed the importance of privacy: *<<We are willing to experiment LBS services as well, taking care of privacy issues in the first place>>*.

5.1.4 Tre Italia

Figure 70 Tre's logo

3 is a brand name under which several UMTS based mobile networks are operated in Australia, Austria, Denmark, Hong Kong, Macau, Indonesia, Republic of Ireland, Italy, Sweden and the UK. The group was founded in 2002 and *Hutchison Whampoa* owns direct majority interests in the companies that operate the networks that are branded *3* (except *3 Hong Kong* and *3 Indonesia*). All 3-branded networks provide 3G technology, registering 29,9 million customers worldwide (March 2011).

The Italian branch of the group (*Tre Italia*) was born under the name *Andala* in 1999. The following year the company obtained one of the five UMTS licenses to operate in the Italian market. In the same year *Hutchison Whampoa* became the major shareholder. During 2001 the UMTS network was deployed all over the country and a deal for GSM roaming with *TIM* was signed. In 2002 the brand *3* was launched.

Tre Italia was the first Mobile Operator in the world to launch UMTS based offerings in 2003. Its major key success factors have been to have:

- The only network entirely based with UMTS technology (therefore it has not had any operating constraints due to mixed GSM/UMTS networks).
- A costumer base that has always been enabled to use UMTS based mobile services (therefore no migration from GSM/GPRS has been necessary).

During the last years *Tre Italia* has evolved its image to become the first Mobile Media Company on the Italian market. In 2006 *Tre italia* was the first Operator in the world to launch the Mobile digital TV based on the DVB-H standard.

5.1.4.1 Financial and operating overview

At the end of March 2011, 3 Italia has 9,096 customers, registering an increase in prepaid customers (+4%) and a decrease in postpaid clients (-1%). Overall the customer base has increased by 2% compared with the same period of 2010. The Operator confirms its position as the smallest Mobile Operator in Italy having 5,1% of the market share for voice services and 11,0% for data services (see 2.1.1). On the contrary it is very active in the wholesale market, hosting 26% of the Italian Mobile Virtual Operators (see 2.2.2).

Looking at revenues from mobile services, *Tre* reached 1,705 Million EUR at the end of 2010, showing an increase by 4% compared with 2009. Overall the Operator performed better than the market average, where revenues dropped by 2,9% (see 2.1.1). Mobile ARPU has been stable during 2009 and 2010 (23,60 EUR/month) and overall, is higher than the one registered by the other Operators. The reason for this performance is that *Tre* has always targeted heavy users, with willingness to pay for mobile services higher compared to the competitors' customer base. As a consequence, *Tre* has performed really well regarding Mobile Internet offerings (*<<We have registered an important growth in mobile Internet>>* (Forte, 2011)) passing from 15% (June 2010) to 19% (February 2011) of the market share in the Internet keys market.

5.1.4.2 Network development

In 2009 *Tre* and *Ericsson* have signed a deal in 2009 with the goal to extend and update *Tre*'s 3G network, including fiber backbones, data charging systems, multimedia platforms, etc. This process will be completed by 2016 and the entire network will be managed by *Ericsson*.

Nowadays *Tre*'s network has the highest population coverage and the Operator is expected to launch 21 Megabit/s offerings all over the country by the end of 2011. 43,2 Megabit/s offerings will be available on 50% of the network (Longo, 2010). The Operator is expected to launch LTE commercial offerings during 2012 (Longo, 2010). Network deployment is expected to start by the end of 2011: *<< We will start covering cities with LTE networks at the end of this year>>* (Forte, Broadband, VAS & Portal Director 3 Italia, 2011). Moreover it is important to note that the Operator has recently been assigned with the two blocks of 5MHz of 1,800 MHz spectrum.

Overall the available information is vague and no more details are available. Therefore *Tre*'s plans for the future can just be sketched, as represented in the figure below, in Figure 62, which represented *Tre*'s plans updated at June 2011.

Figure 71 HSPA+ and LTE. Tre's plan

5.1.4.3 Mobile Services platforms

No information about *Tre´*s plans to develop new platforms is available. For the moment the Operator relies on its portal, with about 1,3 millions customers active per month (Forte, 2011). Tre's offering on its portal is very rich. There is a section called App&Store where one can download music (more than one million songs is available), ringtones, news (weather forecasts, sports, etc.), games, videos, etc. There is also a section with a community where users can chat with their friends, upload videos, etc. This portal is made accessible to smartphones too: *<<All our smartphones have pre-installed widgets […] that link to the contents on our portal>>*, where costumers can find all kinds of contents.

5.1.4.4 Other challenges

As highlighted before, one of *Tre*'s key success factors has always been to have an high value **product portfolio** for mobile devices. Smartphones usage exploded during 2010: *<<2010 has registered a big growth in terms of smartphones diffusion>>* and *<<70% of the costumers acquired during 2010 were smartphones users […] Almost all of them are active mobile internet users>>* (Forte, 2011). Looking at this trend the Operator will act as follows: *<<By 2011, our product portfolio will be composed almost entirely by smartphones>>* (Forte, 2011). Having a quite sophisticated customer base, the Operator has modeled its offering around products such *iPhone* and *iPad* but now is willing to offer even low-cost *Android*-based smartphones.

Besides the cross-Operator **payment platform** above discussed (see 5.1.1.4), offering **charging services** to interested parties is at the center of *Tre*'s interests. Besides the above-mentioned joint initiative (see 5.1.1.4), the Operator considers this business area of vital interest for the future: *<<We are expecting a growth in our billing services for external actors>>* (Forte, 2011).

5.2 Other case studies

The sample of non-Italian case studies consists of: the Sweden-based Mobile Operator *Telia* (5.2.1) and the Norway-based Mobile Operator *Telenor* (5.2.2). To enrich the analysis, an interesting cross-Operator alliance (the *Wholesale Application Community*) to develop a share mobile services platform is explored too (5.2.3).

5.2.1 Telia

Figure 72 Telia's logo

Telia is the global brand used by the Operator *TeliaSonera* to market its mobile and fixed services. The company is the dominant Operator in Sweden and Finland. It is Europe's fifth largest Operator with 157,1 million (Q1, 2011) subscriptions in the following countries: Azerbaijan, Belarus, Denmark, Estonia, Finland, Georgia, Kazakhstan, Latvia, Lithuania, Moldova, Nepal, Norway, Russia, Spain, Sweden, Tajikistan, Turkey, Ukraine and Uzbekistan.

The company *TeliaSonera* is the result of a 2002 merger between the Swedish and Finnish telecommunications companies, *Telia* and *Sonera.* This merger followed shortly after *Telia*'s failed merger with Norwegian telecommunications company *Telenor*, now its chief competitor in the Nordic countries. *Telia* has a history as a state telephone monopoly, before privatization. *Sonera* on the other hand used to have monopoly only on trunk network calls, while most of local telecommunication was provided by telephone cooperatives.

Focusing on the Swedish market, Telia's roots are dated back to 1853 with the foundation of the Swedish Royal Telegraph Agency (*Kungliga Telegrafverket*). Sweden was one of few countries where the Bell System never got a strong hold, because Bell's invention was not patented in Sweden and a Swedish private competitor, *Allmänna Telefon*, was thus able to find an independent equipment supplier in *Ericsson*. In this early competition, *Telegrafverket* with its brand *Rikstelefon* was a latecomer. However, by securing a national monopoly on long distance telephone lines, it was able with time to control and take over the local networks of quickly growing private telephone companies. A de facto monopoly was reached around 1920, and never needed legal sanction. In 1953 the name was modernized to *Televerket***.** During the 1980s the company was a pioneering Mobile Operator with the NMT system, followed in the 1990s by GSM. In 1992 *Televerket*'s regulating functions was split off into *Post- och telestyrelsen* (PTS), The operation of the state radio and TV broadcast network was spun off into a company named *Teracom*. The remaining fixed and mobile Operator was transformed into a government-owned shareholding company, named *Telia***.** When PTS awarded four licenses for the 3G networks in 2000, *Telia* was not among the winners, but later established an agreement to build a 3G network jointly with Tele2 using Tele2's license. Therefore *SUNAB* was founded as the jointly owned company that would in

turn build, own and operate the join 3G network. In 2006 Telia joined the *Freemove Alliance,* formed by *Telecom Italia, Orange* and *T-Mobile* (see 5.1.1)

5.2.1.1 Financial and operating overview

Focusing on the Mobile branch of *Telia* is Sweden, it is important to make some considerations about the Swedish Mobile Telecommunications market. Mobile subscriptions have stably been growing for the last years (+7% from 2009 to 2010) and, more importantly revenues from mobile services have been growing too (+14% from 2009 to 2010) (PTS, 2011). This data differs from what happens in Italy (see 2.1.1) and in the whole Europe (see 1.3), where revenues from mobile services have been dropping for the last years.

It is also interesting to comment how revenues are distributed. Revenues for mobile data traffic increased by 55 per cent, from SEK 2.7 billion to SEK 4.2 billion, while revenues for SMS messages remained unchanged at SEK 2.7bn. In the previous year, 2009, the total revenues from mobile data and SMS messages respectively were of about the same magnitude, but during 2010 revenues from mobile data were significantly greater. They now represent the next largest proportion of the total revenues in the mobile market. Revenues for MMS messages still comprise a small part of the total revenues, even if these revenues increased during 2010 by 10 per cent, from SEK 160m to SEK 176m.

Telia is the market leader holding 40,4% (5,869 millions subscribers) of the subscriptions for mobile calls and data services. Its main challenger is *Tele2* (31,6%) followed by *Telenor* (16,5%) and *Tre* (*Hi3G*, 9%). Looking at the market shares[96], Hi3G has increased its market share for mobile subscriptions every year and is now at about 9%. *Telia*, *Tele2* and *Telenor* have instead reduced their market shares during the period.

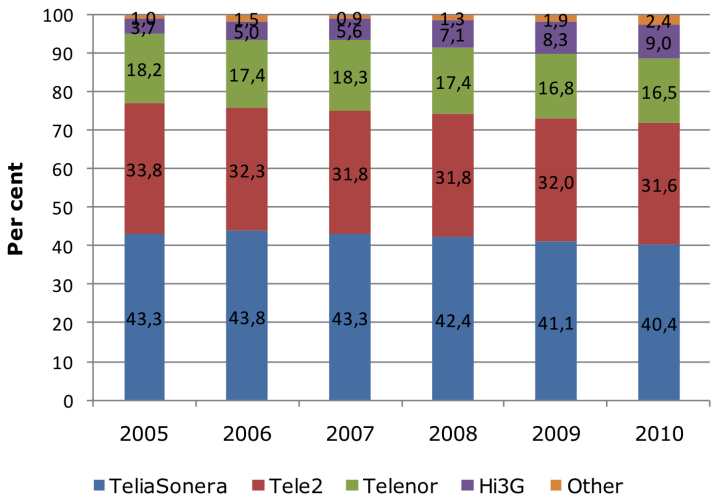

Figure 73 Market shares – subscriptions for mobile call and data services. (PTS, 2011)

[96] Market shares include all subscriptions for mobile call and data services, but not subscriptions for telematics services alone.

Looking closer at the subscriptions for mobile broadband services, the market is more balanced among the Operators. Indeed *Telia* dominates the market with 36,7% (at the end of 2009, the Operator held 37,1% of the market share) while the other three Operators have similar market share: *Telenor* (22,1%), *Tele2* (20,1%) and *Tre* (19,2%).

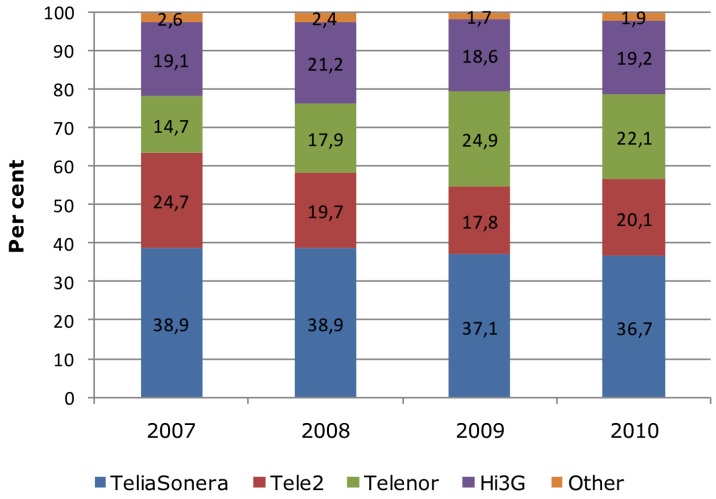

Figure 74 Market shares – subscription for mobile broadband

Telia's revenues from mobile services grew by 9% from 2009 (14114 million SEK) to 2010 (15218 million SEK). This data was pushed by the strong demand for mobile broadband and data services. The *iPhone 4* was the best selling smartphone during 2010, but the sale of smartphones based on *Android* is gaining momentum. Mobile data traffic increased by close to 100 percent and the number of broadband subscriptions rose by 44 percent during 2010 (TeliaSonera, 2011a). Anyway intense competition together with regulatory intervention continued to put downward pressure on prices and margins in all markets.

Looking at *Telia*'s operational KPIs, it is important to stress that both mobile usage and ARPU grew during 2010. The former passed from 182 to 196 minutes/line/month while the latter from 189 to 237 SEK/month. 2010 was the first year showing an increase in mobile ARPU, which has stably been dropping for the last ten years.

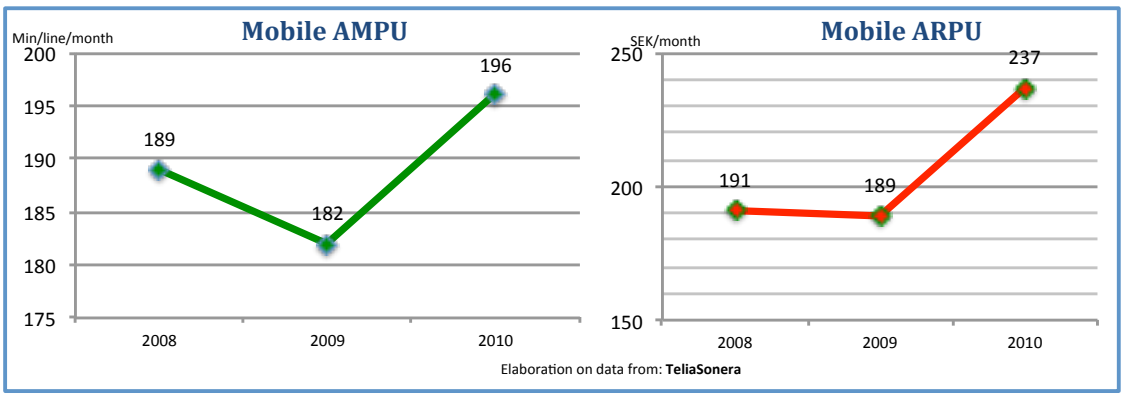

Figure 75 Telia's operational KPIs

5.2.1.2 Network development

In December 2009, *TeliaSonera* was the first Operator in the world to launch 4G commercial services based on the LTE standard in Stockholm, Sweden, and Oslo, Norway (TeliaSonera, 2009). *TeliaSonera* extended its 4G LTE-based network to Denmark (May 2010), Finland (November 2010), Estonia (December 2010) and carried out market pilots in Latvia and Lithuania. By the end of 2011, the Operator is expected to cover around 240 cities in Sweden.

During 2010 *Telia* invested 3,879 million SEK in network development (during 2009 the amount was 3,819 million SEK). Investments included a one-off payment of DKK 336 million for the acquisition of a 4G license in Denmark in the second quarter of 2010. The Operator improved network coverage and capacity, mainly for 3G (UMTS) networks. 4G (LTE) networks build-out continued in 2010 while investments in 2G (GSM) networks declined further in the year. The current network uses the 2.6 GHz band. To incentivize 4G rollout in Sweden, the regulator (*PTS*) held a new auction in February 2011 to assign licenses in the 800 MHz spectrum band. Using lower frequencies will make it easier and cheaper to cover wider areas, therefore these bands are more suitable to cover rural areas. There were six licenses at stake (2x 5 MHz each), all of them technology and service neutral, and participants could buy a maximum of two licenses each (2x 10 MHz). Three bidders won licenses (one 2x10 MHz paired spectrum license each) in the digital dividend band for a total of 2054 million SEK (approximately 233 million EUR). The winners were *Hi3G* (*Tre*), *Net4Mobility* (the company running the network shared between *Tele2* and *Telenor*, see 1.2.1) and *TeliaSonera*, which invested SEK854 million for the licenses.

Despite this huge effort, customer adoption has been really low: six months after the commercial launch, just about 1000 costumers had subscribed 4G services in Sweden (PTS, 2011). At the end of 2010, *Telia* had about 10000 4G costumers in all the served countries. This performance is mainly due to the high fares for 4G mobile data services, whose price range in Sweden is currently between 249 and 499 SEK/month for private customers.

As discussed before (see 1.2.7), 4G offers up to 10 times higher mobile broadband speeds than the turbo 3G network. According to *Telia*, 4G will dramatically improve our customers' experience of interactive and capacity demanding services such as web TV broadcasting, online gaming and web conferences. This technological shift will lead to pure data networks where call services will be IP-based. In Sweden as in other countries, a debate has arisen concerning IP-based alternatives to voice calls in the existing mobile networks, where Operators encounter criticism because with some of their subscriptions they limit the possibility to use telephony that is realized via the Internet.

5.2.1.3 Mobile Services platforms

Telia's strategy with Mobile Services platforms is clear and straightforward. The Operator has already shut down the old mobile portal. *Telia*'s first Mobile portal (*Speedy Tomato*) was launched in 2000 with the ambition to be one of the leading European mobile portals. The project cost several billions SEK and it was set apart just few years later. Following this guideline, the Operator even founded its own media company (*Zed*), which was sold to a Spanish Group in 2004 and it is now leading mobile phone value-added services (MVAS) player in the world in terms of revenue and geographical footprint. After this attempt, *Telia* became less ambitious. The last platform to be launched was Telia Music Player in 2007 but also this project was not successful.

This history of unsuccessful attempts led in 2008 *Telia*'s new CEO Lars Nyberg to rethink corporate strategy to focus just on what Operators can do best: offering world-class high quality access services. Therefore *Telia* has not launched (and does not have any intention to) any application store; on the contrary it collaborates with external Platform Providers to offer connectivity bundled with other services (Ahlbom, 2011). Among its partners, the most interesting ones are:

- ***Spotify*.** Spotify is DRM-base music streaming service offering streaming of selected music from a range of major and independent record labels. The company offering this service (*Spotify AB*) is headquartered in Stockholm, Sweden. It requires client software (available for most of the OS running on computers and mobile devices) to be downloaded. The service offers three versions: *Open* (free, with advertisement and limitations on the amount of hours that can be listened), *Unlimited* (49 SEK/month, it guarantees unlimited streaming of music without advertisement) and *Premium* (99 SEK/month, it allows downloading tracks and running the service on mobile devices too). Telia bundle *Spotify Premium* with most of the smartphones it sell, typically offering the first six months for free. This partnership with *Spotify* is regulated by a revenue sharing contract that guarantees *Telia* about 10-15% of the revenues coming from any *Spotify Premium* service installed by *Telia*'s customers.
- ***Voddler***. An analogous partnership is set with *Voddler*, which is a commercial video-on-demand service and accompanying media player client application distributing movies and television programming using a patented hybrid peer-to-peer distribution system. Even this company (*Voddler Inc.*) is headquartered in Stockholm, Sweden. *Telia*'s partnership with *Voddler* works in the same way as the one with *Spotify* but the bundling has been mainly offered with fixed-line broadband services. Nevertheless in March 2011 *Voddler* launched an application for *iPhone*: this event (coupled with the increasing data rates available on *Telia*'s 4G network) opens new scenarios to extent the partnership to the mobile ecosystem too.

5.2.1.4 Other challenges

Looking at **location-based services**, *Telia* has recently launched its own navigator: *Telia Navigator*. The service requires installing an application that is available for most of the operating systems for both personal computers and mobile devices (i.e. it can be downloaded for free from both *Apple*'s *App Store* and *Android Market*). This service is usually bundled with most of the smartphones sold by the Operator and offered with a five days free trial. Subsequently consumers have to pay a fee to use it. Several tariffs encompassing different coverage areas and duration are available.

Mobile payment is an attractive area too. The Operator is active on several fronts and it is among the top promoters of NFC phones. Besides participating in *Pay-Buy-Mobile* initiative (see 1.2.6.1), an interesting project has been recently launched in in collaboration with the Clarion Hotel in Stockholm, Sweden. The project consists of a pilot for replacing hotel room keys with mobile phones: guests will be able to check in to the hotel and receive the hotel room key directly onto their mobile phones before arriving at the hotel; moreover they can also access other services via their mobile, and on departure, the check-out process using the phone promises to be easy and stress-free (TeliaSonera, 2010).

Another interesting area of development for the future is the **Mobile-ID**. Estonia has become the first country in the world to allow its citizens to cast their votes in the parliamentary elections with their mobile phones. *TeliaSonera*'s subsidiary *EMT* has created a Mobile ID-service that enables verification of people's identity over the Internet, digital signature, and now casting votes electronically as well. The service was launched in 2007 and was initially available only for EMT customers for using e-services created by both private (e-banking, e-service environments) and public (state portal eesti.ee, e-Tax Board, etc.) sectors. Other Estonian mobile operators joined the service platform created by EMT at a later time. In February 2011, new wording of Identity Documents Act that makes Mobile ID a state-approved electronic document as of February 1st 2011 entered into force. In addition to verification of an identity and digital signatures, new state-approved Mobile ID enables to cast votes in elections as well (TeliaSonera, 2011b).

5.2.2 Telenor

Figure 76 Telenor's logo

Telenor Group is one of the leading Integrated Operators in the world providing provides. It has about 120 mobile million subscriptions worldwide and a direct presence in 11 markets with an additional 20 markets through VimpelCom Ltd (31,67% of its shares are owned by *Telenor*). Its operations are organized in the following areas:

- **The Nordics.** *Telenor* is a leading provider of mobile and fixed services in Norway, Sweden and Denmark. *Telenor*'s core business in the region includes *Telenor Broadcast*, which is among the leading providers of television and satellite broadcasting services in the region and operates the national terrestrial broadcast network in Norway.
- **Central and Eastern Europe.** The Operators has a strong position as provider of mobile services in Hungary, Serbia and Montenegro. Across the region *Telenor Group* is focused on growing data traffic and seizing mobile broadband opportunities. 3G services have been launched in Serbia, Hungary, Montenegro and Russia (through *VimpelCom*). In Serbia we also have a license for fixed line operations.
- **Asia.** The Telenor Group is one of the largest mobile operators in Asia and we have strong and growing operations in all our markets. In February 2011, the Operator passed 100 million subscriptions in Thailand, Malaysia, Bangladesh, Pakistan and India.

Telenor started off in 1855 as a state-operated monopoly (named *Telegrafverket*) as a provider of telegraph services. The first telephone service in Norway was offered in 1878. Automation of the telephone system was started in 1920 and completed in 1985. The company changed its name to *Televerket* in 1969. Norway was the first country in Europe to get an automatic mobile telephone system (NMT system in 1981 and the enhanced NMT-900 in 1986). The GSM came into use in 1993. UMTS-based 3G networks began full operation 2004. The authorities wanted to deregulate the telecom sector in Norway between 1994 and 1998. In the second half of the 1990s, *Telenor* became involved in mobile operations in a number of countries. An attempt to merge *Telenor* with its Swedish counterpart *Telia* failed in 1999, while both were still owned by their respective governments. On December 4, 2000 the company was partially privatized and the Government of Norway ownership was reduced to 77.7% of shares. In 2006 the government ownership was further reduced to 53%. In October 2005 Telenor acquired the Swedish branch of *Vodafone*, changing the name to *Telenor* in April 2006.

Overall *Telenor*'s growth has been impressive, passing from 15 million to 120 million mobile subscriptions in less than 10 years.

5.2.2.1 Financial and operating overview

Telenor's number of mobile subscriptions in the Nordic Region increased by 140,000, reaching 7.1 million by the end of 2010. The growth was primarily driven by strong demand for mobile data. (Telenor, 2011b)

In Sweden, *Telenor*'s total revenues in local currency increased by 3% compared to 2009, up to 9.5 billion NOK. Mobile revenues driven by demand for mobile data increased by 9% despite a reduction in interconnect rates and roaming charges. Continued reduction in the number of telephony and broadband subscriptions resulted in a 10% decline in fixed revenues. The EBITDA margin before other income and expenses improved by 2 percent- age points, bringing it to 24%, due to revenue growth and cost efficiency activities. (Telenor, 2011b)

In the Swedish market, *Telenor* has 2,061 millions mobile subscriptions. With 16,5% of the market share the Operator holds the third position after *Telia* (40,4%) and *Tele2* (31,6%). Its market share has been reducing for the last years (from 18,2% in 2005 to 16,5% in 2010) due to the explosion of *Tre*. Nevertheless its main competitors (*Telia* and *Tele2*) registered worse performances: the former passed from 43,3% in 2005 to 40,4 in 2010 and the latter from 33,8% in 2005 to 31,6% in 2010. (see 5.2.1.1)

Focusing on the subscriptions for mobile broadband services, the market is more balanced among the Operators. *Telenor* holds 22,1% of the market share following *Telia* (36,7%) and being very close to *Tele2* (20,1%) and *Tre* (19,2%). *Telenor*´s performance in the last year is good passing from 14,7% of the market share in 2007 to 22,1% in 2010. Nevertheless during the last year (2010) its market share was reduced by 2,8% (it was 24,9% at the end of 2009), mainly due to the excellent performance of *Tele2*, which reached 20,1% (it was 17,8% at the end of 2009).

Looking at the operational KPIs, mobile AMPU has been growing for the last two years, passing from 211 (Q1, 2009) to 233 min/line/month (Q1, 2011). Nevertheless, if the trend is overall positive, the evolution of the AMPU has not followed a linear, as shown in Figure 77. The same reasoning can be applied to the ARPU, which grew from 214 (Q1, 2009) to 237 NOK/month (Q1, 2011), having a substantial drop in 2009.

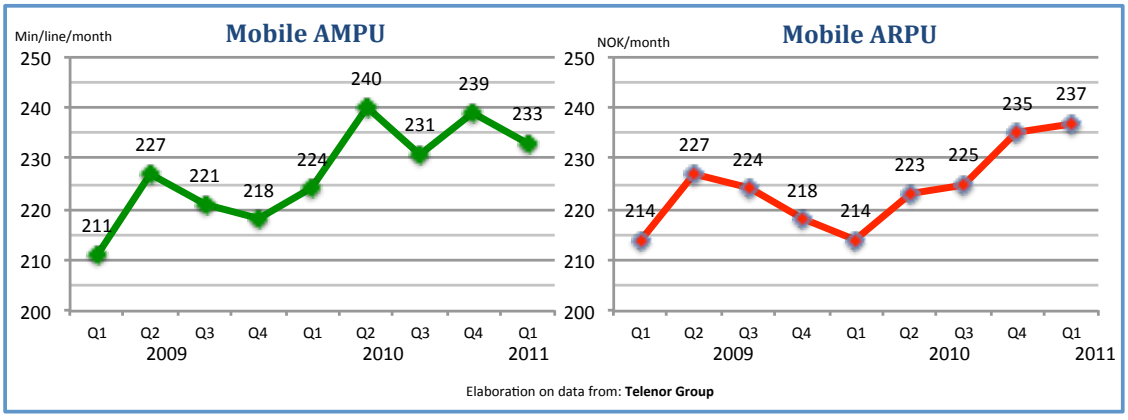

Figure 77 Telenor´s operational KPIs

5.2.2.2 Network development

Telenor holds several spectrum licenses suitable for mobile services in Sweden; one in the 900 MHz band, one in the 1800 MHz band, one in the 2100 MHz band and one in the 2600 MHz band. The Swedish national regulatory authority (*PTS*) decided on 13 March 2009 to prolong the licenses in the 900 MHz band until 2025. The decision includes a re-farming measure that awards the 3G-only operator (*Tre*) a license and clears spectrum for reallocation for deployment in the 900-band. On 8 May 2008, *Telenor*, *TeliaSonera*, *Tele2* and *Tre* secured spectrum in the 2.6 GHz frequency band for a total of 2.1 billion SEK in aggregate. *Telenor* purchased 2x20 MHz FDD for a full LTE carrier for the amount of 534 million SEK.

On 14 April 2009, *Telenor* and *Tele2* announced an agreement to build a joint 4G network in Sweden. The agreement includes the formation of a joint venture (*Net4Mobility*) for network construction and spectrum sharing in the 900 MHz, 1800 MHz and 2600 MHz frequency bands. The licenses have been transferred to the joint venture company. *Net4Mobility* aims at covering 99% percent of the Swedish population to enable *Telenor* and *Tele2* to offer data (LTE) and voice (GSM) services to their customers (Telenor, 2009). By 2011 100 locations will be 4G-ready in Sweden, aiming to expand 4G coverage to up to 200 cities in the next two years. (Telenor, 2011b) The company, which chose Huawei as the initial supplier for its LTE base stations, has also confirmed that it will be the first to launch Huawei's new triple mode LTE/W-CDMA/GSM modem.

In Sweden *Telenor* launched LTE services in November 2010 while the launch in Norway and Denmark will take place in 2012.

Additionally to the above-mentioned bands, *PTS* recently completed the auction of the 800 MHz band. *Net4Mobility* has been awarded a mobile license of 2x10 MHz in the 800 MHz frequency band for approximately SEK 769 million. The purchase price is financed equally by *Tele2* and *Telenor*. Of the total amount, SEK 469 million go to the state and SEK 300 million will be used to build infrastructure in rural areas currently unable to receive broadband. The license is valid for 25 years.

5.2.2.3 Mobile Services platforms

Telenor is very active with Mobile Services platforms. Indeed the Operator has recently announced the launch of a pilot project in Serbia to develop an Application Store adhering the *Wholesale Application Community* initiative (see 5.2.3). The platform will not be limited only to WAC but will also offer *Android*, *Symbian* and *Java* content to participants in the pilot. This project is run in partnership with *Ericsson* (which will provide a content management solution connected to *WAC*) and *Opera Software* (which will develop the interface for the storefront on the mobile). As this is a pilot project, the applications made available for Serbian customers will be free of charge. Developers will make the applications and submit them to *WAC*'s application repository. Then *Telenor Serbia*'s App Store will retrieve the apps from *WAC* that we want to make available to customers through the storefront client. (Telenor, 2011c)

The Operator aims at achieving positive results with this pilot and that this example will serve as a recommendation for all Telenor units to support this initiative. Indeed following the completion of the pilot in Serbia, *Telenor* will prepare for a wide scale launch of *WAC* among the different market served by the group. *Telenor* is aiming for the end of 2011/early 2012 for a market-by-market release. (Telenor, 2011c)

5.2.2.4 Other challenges

The Operator has been very active on another front, developing a platform for Service Providers called *Content Providers Access*. The platform enables Content Providers to deliver content to *Telenor*'s subscribers and bill the subscriber for that content. By doing this *Telenor* has made its value chain accessible to content providers of mobile services, based on a revenue sharing transaction model in return. Today CPA supports billing by SMS, MMS and Internet/WAP. They generate within Norway roughly $100M per year in revenue, that is 6% of *Telenor*'s total subscription revenues. More specifically *Telenor* offers an amount of APIs to the Content Providers covering the following areas:

- **Messaging**. This service enables content providers to send SMS or MMS messages to *Telenor Mobile*'s subscribers and at the same time bill the subscriber for using the service. Most popular services through this technology are distribution of ringtones, pictures, logos, themes, screen-savers, chat and voting.
- **Browsing**: *Telenor* is a platform enabling third party content providers access and billing of *Telenor*'s customer base. *Telenor* will handle all demands of payment on behalf of the content provider with settlement by the end of each month.
- **Events**: high capacity SMS service, made for events such as marketing campaigns, SMS-voting and media interaction.
- **Goods and services.** Since January 2010, *Telenor* offers the billing of non-digital goods and services (exclusive digital goods distributed on a physical medium) i.e. parking tickets, public transport and magazines.

Besides this initiative, *Telenor* have an articulate offering of **location-based services** for a wide range of Service Providers . (Telenor, 2011a) With GSM/3G positioning the client can locate any mobile phone which belong in *Telenor*'s network if the mobile phone is switched on and has coverage. It is not possible to locate foreign mobile phones that roam in *Telenor*'s network. It takes about 4 seconds to locate a mobile phone. The accuracy of GSM/3G positioning varies in different areas depending among other things on the distance between antennas. A general assumption is that 90% of the mobile phones can be located within 500 meters inside of a city and that 90% of the mobile phones can be located within 10 km in rural areas. The GSM/3G positioning always gives an outer limit of the area in which the mobile phone is.

This positioning service does not require any update to the SIM card or the mobile phone. Moreover, a wide range of agreements with *Telenor* are possible, offering different positioning capacities (It is possible to locate several mobile phones within one second) and different priorities (High, Medium and Normal).

5.2.3 The Wholesale Application Community

The *Wholesale Applications Community* (*WAC*) is an Operator-driven industry platform initiative based on the idea to create joint storefront to encourage open standardized technologies, drive scaled deployment of these technologies and provide complementary commercial models (Goncalves, Walravens, & Ballon, 2010; Werding, 2010). The alliance completed its acquisition of the *Joint Innovation Lab* on 1 October 2010, accelerating the commercial launch of WAC-enabled application stores and put it in a position to be fully operational and commercially running before the end of 2010 and the platform was officially launched on February 14th 2011.

Platform's first goal is to help Mobile Operators to commercialize applications through a branded application store. Operators will access to the *WAC* catalogue and build their own store on the top of it. To achieve this goal, Application Developers have to be attracted by simplifying and lowering the cost of their development, testing and deployment. Therefore a suitable development platform has been created adopting technologies based on HTML, JavaScript, and CSS. More specifically this platform builds on the work of the former *Open Mobile Terminal Platform Ltd.*'s *BONDI project*, the *Joint Innovation Lab* device APIs and the *GSM Association*'s *OneAPI* program. By utilizing web-based technologies, rather than relying on developers to write native applications for specific devices, the *WAC* alliance believes it can spur the development of more applications across a much wider range of devices.

WAC essentially operates in the dual role of clearinghouse for developers and centralized apps pool for carriers. The apps are local, web-based, largely *W3C* widgets around which the community has built standards, definitions, structures and formats. The *WAC 2.0* standard was released in February 2011, and includes support for HTML5. *WAC 3.0*, which is due in September 2011, will open up richer opportunities in-app billing and authentication.

This platform allows to substantially reduce **fragmentation** (Bender, 2011): dealing with different devices, OS, Operators, etc. Indeed Developers will be able to deploy applications across multiple devices (through the use of standard technologies) and across multiple Operators, without the need to negotiate with each of them (Watkins, 2011). Operators will release some APIs (for functions such as billing) so as Developers can integrate these services into their Applications. Moreover *WAC* will provide the commercial enablers that will allow the developer to be paid for the applications that are then sold through any associated application store.

WAC's common platform vision put everyone on a level playing field in terms of developer access, there's no similar requirement when it comes to **revenue sharing** models. Indeed Operators are free to chose the most suitable business model as they have all sorts of sensitivity points in that regard, whether it's regulatory or market driven. Models can cover a broad spectrum of free, paid and shared, with operators in a position to negotiate exclusivity with developers as part of an overall strategy to differentiate within the limits of a popular OS.

Membership now stands at 68 companies (Wireless Intelligence, 2011a). *WAC*'s Board of Directors is composed by the following **Operators**: *AT&T*, *China Mobile*, *Deutsche Telekom*, *GSMA*, *KT*, *NTT DoCoMo*, *Orange*, *SK Telecom*, *SMART Communications*, *Softbank Mobile*, *Telekom Austria group*, *Telecom Italia*, *Telefónica*, *Telenor Group*, *Verizon Wireless*, *Vodafone*. Besides these Operators, the Board is completed by: *Accenture*, *Ericsson*, *Huawei*, *Intel*, *Qualcomm*, *Samsung*.

The **Device Manufacturers** that support the *WAC* platform are *Huawei*, *LG*, *Samsung*, *Sony Ericsson* and *ZTE*; all of them are currently pinning their smartphone strategies on the *Android* platform (Lunden, 2011d).

At the launch (February 14, 2011) about 12,000 apps are available. This is a solid start, and more impressive numbers than the initial apps offering from rival stores such as *Windows Phone 7 Marketplace*. But it remains dwarfed by *Android Market* and *Apple*'s *App Store* (150,000+ and 300,000+ respectively, see Figure 78).

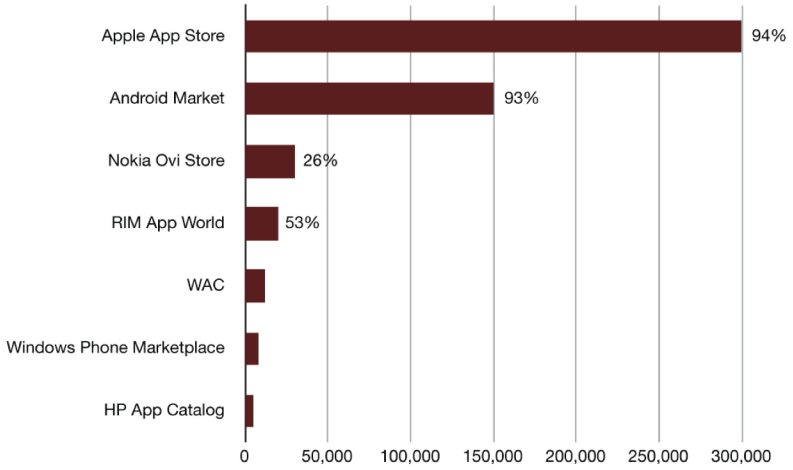

Figure 78 App store inventory totals and % of regular users. (Wireless Intelligence, 2011a)

Ericsson is the first supplier to provide a white label store, fully integrated with the *WAC* content catalogue and readily available to the Operators adhering to the *Community* to brand and take to market in a very short time (Ericsson, 2011). Also the Chinese vendor *Huawei* and *IBM* have developed similar solutions.

In February 2011, these were the Operators said to be ready to offer WAC-enabled Application Stores: *China Mobile*, *MTS*, *Orange*, *Smart*, *Telefonica*, *Telenor*, *Verizon* and *Vodafone* (GSMA, 2011a). After four months (June 2011), the following stores have been launched:

- The Norwegian Telecommunications group ***Telenor*** is piloting a project in Serbia with *Ericsson*'s white-label Application Store connected to WAC, the first white-label store fully integrated into WAC (see 5.2.2.3). The idea is to develop a global application store, integrated with the WAC content catalogue, where users can download applications, regardless of which mobile phone they are using, is a new way of working that's beneficial to both the users.
- ***TIM Store*** (see 5.1.1.3), *TIM*'s brand-new Application Store developed in collaboration with *Telefonica,* which will soon launch a similar service

temporarily called ***Frigo*** (no more information about the release date is available).

- Philippines' leading Mobile Operator ***Smart*** has launched a WAC-enabled Application Store developed by *Huawei*, which will also be providing a compatible handset to the carrier.

Besides being extremely interesting due to the above-mentioned characteristic, this initiative as leveled some criticisms:

- The alliance among Operators is just another late-to-the-party attempt to muscle in on a market they did little to create or innovate on. This argument has some limitations because Mobile Operators have been trying for at least ten years to provide applications within a mobile framework but delays caused by issues around devices, software services and topography and different commercial models have all contributed to a less than speedy emergence out of the blocks.
- Another potential sticky point is WAC integration with existing platforms, due to the fact that many Operators have multiple app offerings, and the long-term success of WAC will require the merger of these stores into a unified WAC service. Examples are *Vodafone* (with its platforms *Live!* and *360*, see 5.2.3) and *Telefónica* (with its *mstore* platform, launched in September 2009[97]).

[97] The store was launched on September 21, 2009 more than 1,000 applications, which have been classified into 14 categories: Games, Dictionaries, Entertainment, Finance, Health, GPS-Maps, Information, Photos and Videos, Social Networks, Travel and Books, Sports, Shopping, Tools and Education/Children. A the launch, programs cost anywhere between 0.49 euros and 19.99 euros (not including sales tax), although around 10% of them are free of charge.

6 Operators and Mobile Services platforms: SWOT analysis

The previous chapters identify important theoretical and practical hints to develop the value network model. Anyway one more step has be done by analyzing more specifically the strategic impact of Mobile Services platform initiatives on Mobile Operators. To accomplish this task a SWOT analysis is performed, following the guidelines listed by *Kotler & Keller* (2009). This approach allows identifying the key **internal** (Mobile Operators' strengths and weaknesses) and **external** (opportunities and threats within the Mobile Services domain) factors that have to be taken into consideration to evaluate the strategic impact of Mobile Services platform initiatives on Mobile Operators. Moreover, this approach allows gathering together and organizing many of the observations done until now.

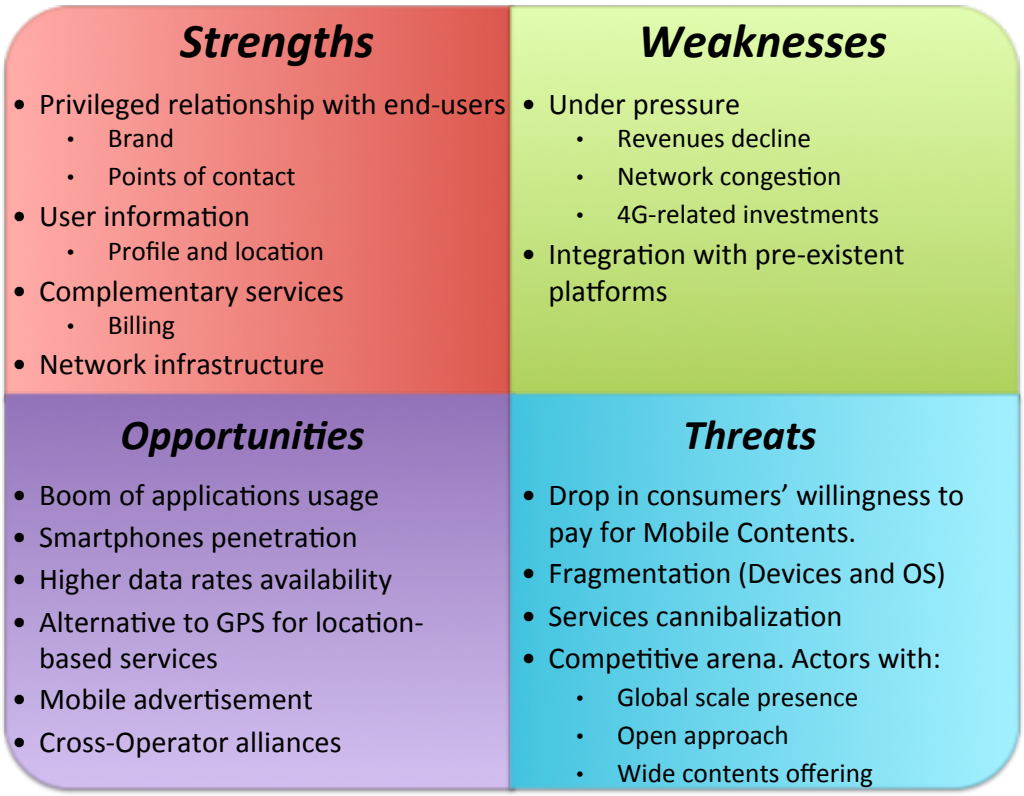

Figure 79 SWOT Analysis

Developing the SWOT analysis, primary data coming from the interviews released with top managers working for European Mobile Operators (see 4.2) have a crucial role to:

- Find important confirmations about what emerged from secondary data.
- Refine the ideas and identify new elements to include in the analysis.

The main considerations emerging from the analysis (see 6.5) constitute an important input for developing the value network model as later explained (see 7.2).

6.1 Strengths

Mobile Operators hold the following assets (Bang, et al., 2009; Holzer & Ondrus, 2009):

- **Privileged relationship with end-users.** Mobile Operators and end-users are tied together by direct (and sometimes even long-term) relationships. Consumers are familiar with Operators' brand and they can be reached even through physical points of contact such as stores, etc. Customer care services are one of Operators´ crucial assets (De Carlo, 2011). Brand strength is effective in Operators´ traditional services (voice and data) but definitely less when it comes to contents (see 6.4).
- **User information**. As a consequence of the previous point, Mobile Operators have been storing more information on their subscribers than banks: who did the call and when, which text messages are sent and received, location, user profile, free minutes/texts remaining and much more. This information represents a value within this domain as it allows doing a better targeting for services and advertisement (see 6.3). SIM cards allow identifying users on the network; therefore they have a strategic role for Operators, as confirmed by *Vodafone Italia: << [one of] Operator's goal is to make SIM cards the core of customers' digital life>>* (De Carlo, 2011).
- **Complementary services**. They run a valuable set of services that are complementary to each other. Examples are billing, SMS/MMS/e-mail, user alerts, voicemail, IVR services, chats, etc. As these services have been exposed only in few cases to other networks (i.e. SMS roaming) or Aggregators (i.e. premium SMS billing, location) they represent a dormant revenue opportunity (Bang, et al., 2009).
- **Network infrastructure.** Mobile Operators own and run the mobile networks where mobile services are delivered to end-users. This position, from one side make them essential in the Mobile Services domain, from the other has allowed them to develop a remarkable expertise in the domain.

6.2 Weaknesses

Mobile Operators' biggest weakness is to operate under increasing pressure, which is the result of different factors such as:

- **Revenues decline.** Operators' revenues are threatened by a combination of trends as widely discussed before (see 1.3).
- **Network congestion.** Mobile Operators are currently experiencing problem to deal with the increasing traffic generated on their network, caused by increasing diffusion of smartphones and other devices (see 1.3). Future trends depict an even worse situation as data traffic is expected to grow by 1000 times during the next ten years (see 1.2.7). This thread is confirmed by Roberto Forte (2011) at *Tre Italia*, who said: *<<We have been experiencing a growth in data traffic pulled by smartphones>>* and added: *<< A smartphone can generate even 400 MB of traffic per month>>*. Anyway smartphones are not the main threat as *<<Big problems come from Internet keys […], whose data usage has been growing by 50% during 2010>>.* Alessandro Lavezzari (2011), executive at *Wind*, is on the same wavelength:

<<We are worried by traffic explosion […] our investments to cope with this trend are huge>>. *Vodafone Italia* confirms that network congestion is one of their biggest problems: *<< Data growth is exponential […]. Operators will have to confine customers' broadband services usage, otherwise it will not be sustainable anymore>>* (De Carlo, 2011).

- **4G-related investments.** To cope with present and upcoming network congestion problems, large investments (for spectrum and network equipment) are needed. In the European context, LTE technologies are experiencing a boom (see 1.2.7.1).

It can be argued that these pressures are related to external factors. From a certain point of view, this is true: the Mobile Services market[98] (and not the Operators by themselves) is pushing towards lower tariffs and end-users are the ones generating exponentially growing data traffic so that Operators are experiencing congestion problems and need to heavily invest in network technologies.

Nevertheless, adopting the Operator-centric perspective that distinguishes the whole investigation, it is important to point out that all these factors imply Operators' internal issues: they have to plan their investments taking into account that their own network can not cope with the upcoming data traffic demand and that their own revenues are threatened. Moreover network resources are assets Mobile Operators have total control on and, under certain hypotheses, a similar reasoning can be applied to revenues too. These motivations are enough to consider these factors as weaknesses.

Another disadvantage the Operators may face is the **integration with pre-existent platforms**. As discussed before (see 1.2.1, 1.3, -) many Operators have been developing their own platforms during the last decade following the Mobile Portal paradigm (see 1.1.3). Integrating existing systems with new ones is not an easy task, as confirmed by *Vodafone Italia,* that has to deal with its old platform *Vodafone Live!* (see 5.1.2).

6.3 Opportunities

The Mobile Service domain is experiencing a boom. Video, games and music head the top mobile activities chart (see 1.1.3). This boom is pulled by **applications**. A survey by *Zokem Research* (GSMA, 2011b) shows that Mobile Applications are responsible for 667 minutes of use per user each month, almost as much as messaging (671 minutes), and far more than voice (531 minutes) and web browsing (422 minutes). A research by *Gartner* confirms what said above: 17.7bn Applications will be downloaded in 2011 (+117%, compared with 2010) and revenues from Mobile Applications are expected to surpass $15.1bn this year, up from $5.2bn in 2010 (Watkins, 2011).

This boom is strictly linked with **smartphones penetration**, which is rapidly increasing in the EU countries (see 2.1). *Vodafone Italia* confirms this trend*: <<2010 has been the year of smartphones. […] during the next year we expect to sell mostly smartphones>>* (De Carlo, 2011). Smartphones are "hungry" devices (they consume up to five times the bandwidth of a traditional mobile phone) that

[98] Group of end-users, as previously classified (see 1.1.5), that is interested in Mobile Services.

pushing to the **Mobile Internet explosion**, allowing exploiting applications and multimedia contents with good performances. These devices have good impact on Operators' business as *<<A customer who changes his/her traditional phone with a smartphone has an important value for the Operator. [...] we see an increase in expenditures in all the area: voice, messaging and internet>>* (De Carlo, 2011).

Another aspect playing a crucial role in the mobile services boom is the **availability of higher data rates** (up to 80 Megabit/s) due to the introduction of 4G technologies. In some countries (as Scandinavian ones) this opportunity can already be exploited; other countries will have to wait until 2012 (see 1.2.7, 2.2.6). Higher data rates open up prosperous scenarios for mobile services, which can be more and more sophisticated and interactive.

Another big opportunity is represented by **Location-based services** (LBS): services (offered to end-users) that integrate wireless technology, positioning technology and location information management. Examples are: location-based information (i.e. list of restaurants within a certain proximity to the mobile user), location-based billing (i.e. defining zones where obtain special rates on certain kind of services) and tracking (i.e. vehicles, items). The ideal characteristics of these services are (Bellavista, Kupper, & Helal, 2008):

- **Proactive**. Automatically initiated when a predefined event occurs (i.e. the user approaches a certain point of interest).
- **Cross-referencing**. The user does not coincide with the target (whose location is requested for LBS provisioning) thus stronger privacy protection is required.
- **Multi-target**. Focus on interrelating the positions of several targets among each other.
- **Application-oriented**. Compared to content-oriented services (aimed to deliver relevant information depending on users' location), these services provide a more powerful and richer interaction model, with autonomic installation and removal of dynamically needed components. These features improve the user experience.

The same authors point out that Mobile services are moving towards being location-oriented / context-aware [99] : therefore cheap anytime anywhere positioning in both outdoor and indoor environments has to be provided. Positioning can be either satellite-based (i.e. GPS; capable devices needed) either network-based (i.e. 3G, Wi-Fi). Hybrid approaches (i.e. A-GPS) are common too. According to *ABI Research* (2010), GPS alone will not be sufficient to support the next generation of services and, therefore, Wi-Fi and other technologies will become the most widely available over the next five years.

Mobile Operators can play an important role in this area. Thanks to their network, Operators are able to identify subscribers´ position through the SIM card installed

[99] It is important to distinguish between location tracking and location-aware. Whereas location-tracking services focus on particular coordinates, location-aware services go a step beyond: they also include the coordinates of the surrounding context and are expected to provide a better socio-technical fit (Junglas & Watson, 2008).

on their devices. This technical opportunity can be translated into a proper offering for interested Service Providers, which can buy this information to develop Location-based services for end-users. Operators´ offering may encompass APIs to integrate services and applications with Operators´ info[100], etc. According to *Telenor*, their location-based services are able to establish devices position in a radius of less than 300 m (over a GSM network) that become less than 250 m using an UMTS network; devices position can be discovered in about four seconds (Telenor, 2011a). 4G technologies (see 1.2.7) are going to further push these services as they are expected to improve positioning performances (Bajaj, Babbar, Chawla, & Malhotra, 2009).

Also **advertisement** is going to be relevant in the Mobile Services domain. Indeed the potential for mobile advertising has expanded significantly with the rise of smartphones, which offer large screens, constant Internet connections and software applications in which to display marketing messages (Bender, 2011; Bradshaw, 2011). Consequently Mobile advertising platforms are drawing the attention of many actors within the Mobile Services domain but there is still a long way to go as problems such fragmentation (see 6.4) are still present. This trend is confirmed by big players' moves. Besides existing initiatives as *AdMob* (acquired by *Google* for $750 million in 2009), new actors as *BlackBerry* (with its *Advertising Service*) and *Apple* (that acquired *Quattro Wireless* in 2010 and absorbed into its own *iAd* network) have entered into the battlefield during 2010. The idea is to offer services that reduce the commercial and technical complexity of enabling ads within applications/devices and offer developers a new avenue of monetization.

Mobile Operators are making their moves too, taking advantage of advertising agencies' desire for greater competition to *Google* and *Apple* in the fast-growing market (Bradshaw, 2011). For example, *Telefonica* has created a business unit that deals with global advertising solutions, allowing agencies to buy ads to display to its 250 Millions mobile customers in 25 countries, across Europe, the US and Latin America. *Telecom Italia* is working in this direction too (see 5.1.1) as well as *Wind*, who declared: *<<During 2011 we will start working with Mobile Advertisement. We have still to decide how to play in this domain>>* (Carra, 2011).

Moreover, as exemplified by the *Wholesale Application Community* (see 5.2.3), Operators have joined forces creating **cross-Operator alliances** to develop shared Mobile Services platforms so as too reduce costs and risks of having independent systems.

[100] One of the standards for LBS is MLP3.0, whose basic messages are SLIR (Service Location Immediate Request) and SLIA (Service Location Immediate Answer).

6.4 Threats

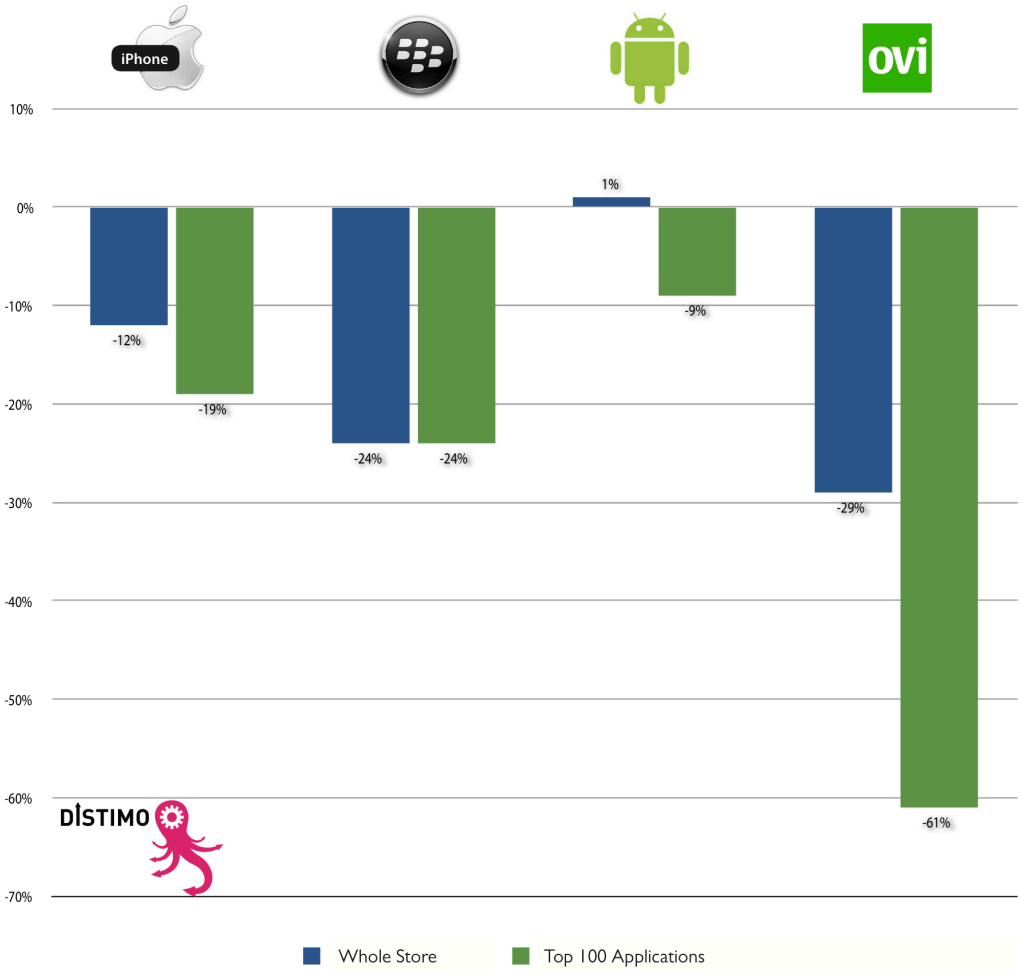

Figure 80 Changes in the average price of the applications. Period: January – December (Distimo, 2011)

A major threat is represented by the **drop in users' willingness to pay for Mobile Contents**. A research by *Distimo* (2011) shows that the average price of the applications available on the four biggest Application Stores (*Apple*'s *App Store* for *iPhone*, *Blackberry App world*, *Google's Android Market* and *Nokia OVI store*) declined sensibly during 2010. As shown in Figure 80, a decline in price on all four platforms can be observed in the 100 most popular applications as well as in all applications (with the exception of *Android Market*). This phenomenon may be due to the increase in competition.

While the average price of the application declined, the proportion of free application grew too during 2010. Indeed, as shown in Figure 81, aggregated data across all four Application Stores indicate a shift to the lower price tiers, where the $1.00 to $1.99 pricing tier gained popularity over the last year among developers.

The research by *Distimo* is focused just on the Application Stores, which are a particular kind of Mobile Services platform (see 3.2.1.2). Therefore associating a drop in users' willingness to pay for the applications with a (more general) drop in users' willingness to pay for Mobile Contents has to be commented. As discussed before (see 6.3), applications represent the "trendiest" Mobile Service nowadays. This allows us to consider applications as good proxy of a more general trend in the Mobile Services domain.

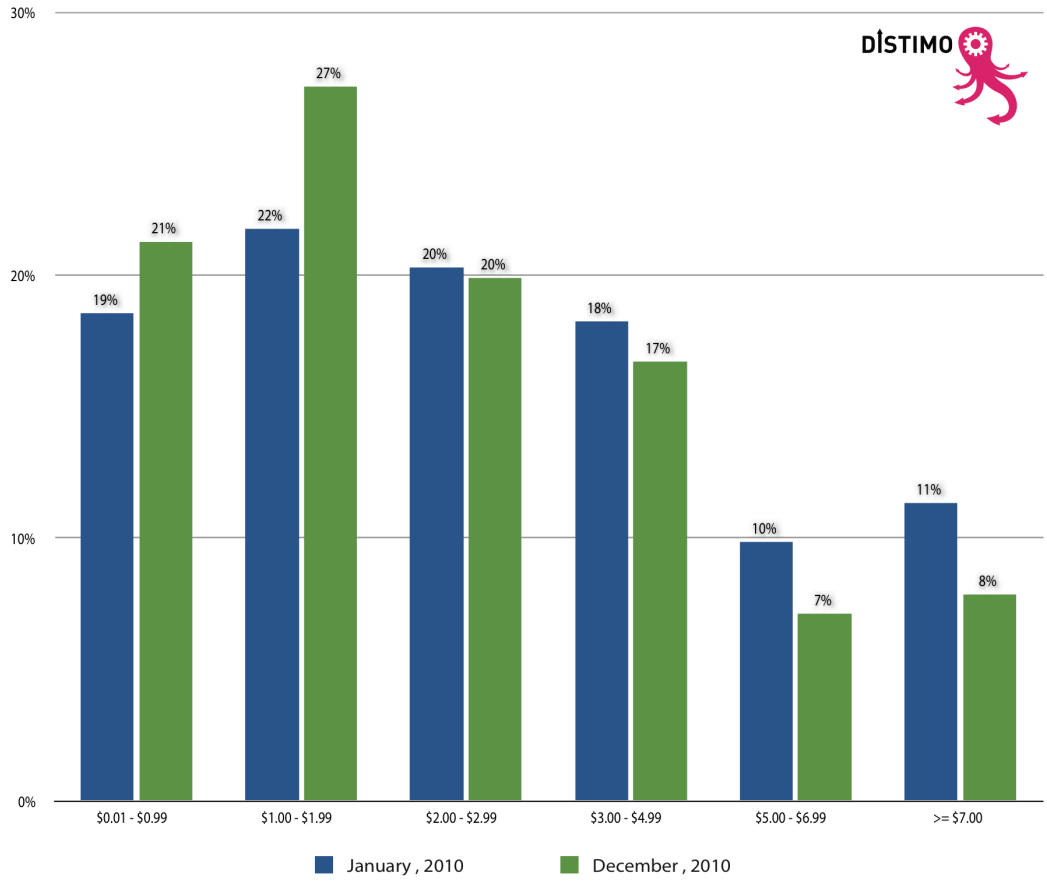

Figure 81 Aggregate price distribution. Period: January – December (Distimo, 2011)

Fragmentation (dealing simultaneously with different devices, OS, etc.) represents a further threat. Indeed dealing with many OS and devices complicates Operators´ and Service Providers´ life. The importance of this threat is confirmed even by numerous upcoming initiatives (such as *WAC*, see 5.2.3) that put interoperability among the biggest issues they promise to defeat. Nevertheless it is important to point out that, from the other side, having many OS and devices manufacturers gives these players more bargaining power in the relationship with the Operators.

While at the device level the phenomenon has still wide implications, at the OS level, it is expected to reduce after *Nokia*'s move to adopt *WP7* (see 3.2.3). As shown in Table 12, within a couple of years the OS ecosystem will be dominated basically just by three OS: *Android*, *iOS* and *WP7* by *Microsoft* (Wireless Intelligence, 2011a).

	2010	2011	2012	2015
Android	22.7	38.5	49.2	48.8
Microsoft	4.2	5.6	10.8	19.5
Apple	15.7	19.4	18.9	17.2
RIM	16	13.4	12.6	11.1
Symbian	37.6	19.2	5.2	0.1
Others	3.8	3.9	3.4	3.3

Source: **Gartner, April 2011**

Table 12 Worldwide mobile OS market shares 2010-2015

Operators may experience **voice and data services cannibalization** too. Mobile Internet has given users the possibility to access to VoIP and Social Networks services directly on their mobile phones. Some Operators are scared the former may cannibalize traditional voice services while the latter may cannibalize SMS services. Regarding VoIP services, it emerges that Operators have different positions: the Italian Operator *Wind* takes this risk into consideration: *<<VoIP is growing by 50% in the last months. […] There is the actual risk that VoIP could cannibalize mobile voice services>>* (Lavezzari, 2011). On the contrary an executive at *Tre Italia* said: *<<VoIP has a lot of limitations, therefore it does not scare us>>* (Forte, 2011). Executives at *Vodafone Italia* agree with this position: <<*We are not seeing a cannibalization of voice services by applications as Skype, Viber, etc. >>* (De Carlo, 2011). The Swedish Operator we have interviewed is on the same wavelength. Anyway, due to the huge data traffic generated by VoIP services, some players (i.e. *Vodafone* and *Wind* in Italy) have decided to stop these services on their networks.

Operators are less scared by threats coming from social networks as *Facebook*. Roberto Forte (2011) at *Tre Italia* declared: *<<At the moment, we are not afraid that social network usage can substitute SMS usage>>*. *Wind* is on the same wavelength: *<<Facebook can become a boomerang for Mobile Operators as well. […] Anyway it is not damaging SMS usage that keeps on growing>>* (Lavezzari, 2011). At *Vodafone Italia*, they are more worried about social networks: *<<Facebook & Co. can substitute traditional messaging services>>* (De Carlo, 2011). Also the Swedish Operator confirmed this threat. *Vodafone* instead stated that *<< Facebook has important effects on SMS usage, whose increase is getting lower and lower every year (just +8% during 2010)>>* (De Carlo, 2011) but also that this phenomenon can have positive effects on Operators´ strategies: *<<Operators can use social networks to achieve customers loyalty>>* (De Carlo, 2011), as exemplified by initiatives such as *Twitter® SMS* (see 5.1.2).

To conclude, some comments about the **competitive arena** have to be done. As discussed before (see 1.3), the competition is strong and actors such as *Apple* [101], *Facebook* and *Google* (with *Android* and its *Market*) can compromise Operators' relationship with end-users. They are gaining more and more traction among consumers. Indeed brand commitment[102] to Service Providers[103] is increasing (+4% in 2011) while Mobile Operators and Device Manufacturers are loosing ground (Figure 82).

[101] The company is adopting a comprehensive strategy by supplying OS, devices, Application Store and has plans to expand its interests over SIM cards too (see 1.3).

[102] The term brand commitment is used to indicate the degree to which a customer is committed to a given brand and is likely to re-use/re-purchase in the future. Figure 82 represents the percentage of population committed to brand categories.

[103] In this case the term Service Providers is used as a synonym of Content Providers. This choice allows keeping consistency between the terminology used in the work and in the report by TNS NIPO (2011).

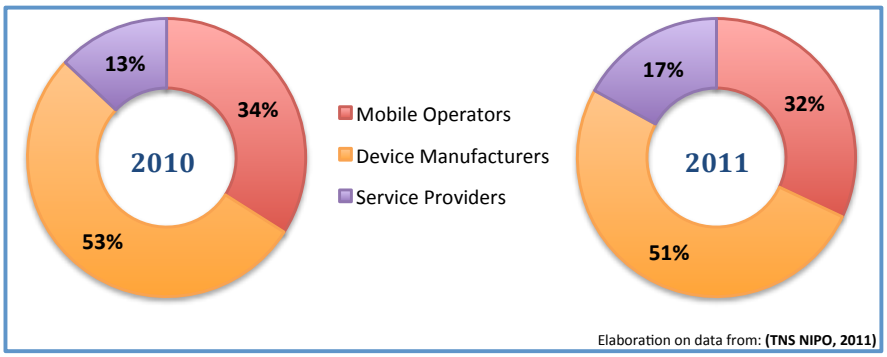

Figure 82 Share of commitment to brand by actors

These actors can count on:

- **Global scale presence**. Most of the platforms are operated on a global market by well-established brand: this approach allows Platform Operators to reach economies of scale and attract a large amount of Developers.
- **Open approach**. Enablers for third parties (see 3.2.1.2) play a crucial role to attract Developers.
- **Wide contents offering**. As a consequence of the previous points, most of the existing platforms offer a wide range of contents (see 5.2.3) that new mobile services platforms would have difficulties to beat.

6.5 Conclusions from the SWOT analysis

The Mobile Services domain is a system characterized by an unstable equilibrium. Mobile Operators on one side and a heterogeneous group of actors (Device Manufacturers as *Apple*, Service Aggregators[104] as *Facebook* and OS Manufacturers as *Google*) on the other side are fighting for the gatekeeper role (see 3.2.3.3). Both sides have their strengths (Figure 83): the fight is open, even if the latter seems to have better chances then the former.

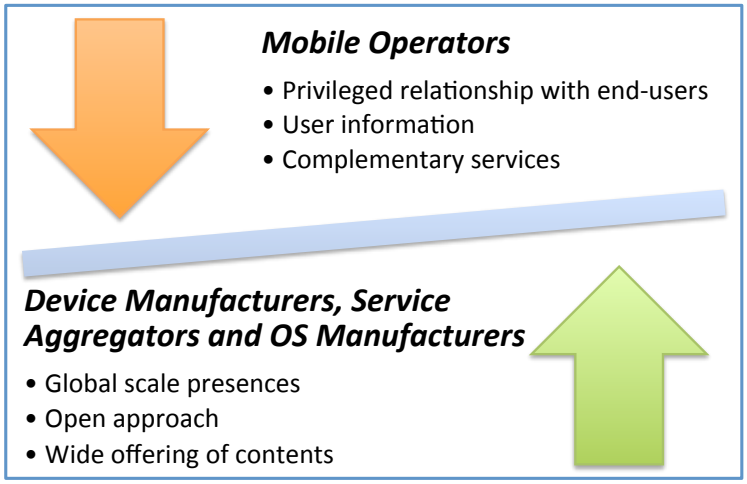

Figure 83 Mobile Services domain: an unstable equilibrium

Beside this aspect, the Mobile Services domain is experiencing a boom in services usage, coupled with a drop in users' willingness to pay for these services. To deal with this trend and the competitive threats, Mobile Operators need to find monetization methods other than paid (by the users). The technological need for alternatives to GPS as well as the growing importance played by mobile advertisement make possible for Mobile Operators to sell user information (i.e. the location) to interested parties. They have all the resources to play this role as they own the infrastructures where this data flow and their offering (voice, data, etc.) is complementary with this kind of initiative.

Growing smartphones penetration and higher data rate availability support this scenario too, by making possible to obtain targeted advertising within location-based services. The ideal configuration encompasses actors such as Advertisers and Service Providers (that can purchase this information to improve their services or business in general) and users, who get access to more personalized and useful services (i.e. location-based) at a decreasing cost.

Anyway Operators' position is not easy as they are under pressure: while revenues are dropping there is a need for high 4G-related investments to cope with data explosion. Where present, pre-existent platforms are an issue too. For this reasons, industry-wide alliances to build common platform are attractive.

[104] This term is used by Ballon (2009) to describe *Facebook Platform* (see 3.2.3.1).

7 An innovative value network model for the Mobile services domain

To answer the questions leading this investigation in a systematic way, we should refer to a value network model that encompasses Mobile Services platforms. This model has to take into account the most important current trends. Existing models have limitations in this sense because they are not updated with the last industry evolutions (see 1.2). Indeed, as discussed before (see 3.1), networks do not remain stable but evolve over time and the evolution pace has been higher and higher for the last couple of years.

Therefore the goal is to develop a **platform-mediated** value network model for the Mobile Services domain, mapping the most important current and future trends. This model has to be **innovative**, in the sense that it has to track new ways of cooperating among actors in the value network (Wu, Zhang, & Chen, 2010).

As discussed before, developing this model needs a strong theoretical framework that encompasses the value networks theory (see 3.1), the platforms theory (see 3.2). This theoretical part has been coupled with a case studies analysis (see 4) and further improved by identifying key internal and external factors to assess the strategic impact of Mobile Services platform initiatives on Mobile Operators (SWOT analysis, see 4).

This knowledge is the starting point for the developing process that, as stated before, is organized in the following steps:

- **Step 1: choosing the methodology** (7.1)**.** To design and analyze a value network model, a proper methodology is selected: the *e³value.* This methodology provides a semi-formal ontology to represent economic value creation, distribution and consumption in a multi-actor network.
- **Step 2: developing the model** (7.2)**.** The development process follows a simple guideline: start with a model as simple as possible and progressively add complexity to it, aiming to obtain a final configuration as similar as possible to the reality. Coherently with this approach, the first task is to identify the actors operating in the Mobile Services domain. This is done in three phases, starting from a core network that is progressively enlarged. Subsequently value activities are explored for each actor.
- **Step 3: comparing the results with existing models** (7.3)**.** The model developed in the previous step is compared with other existing models to assess similarities and differences.
- **Step 4: drawing conclusions** (7.4)**.** This step consists of identifying the most important contributions coming from the model developed at Step 2. This analysis is divided in two parts: the first is focused on how the model contributes to the current knowledge about Mobile Services platforms; the second deals with how the model identifies current and future strategic challenges for Mobile Operators in a structured way. These strategies are listed and discussed referring to the case studies
- **Step 5: looking beyond the model** (7.5). The strategies identified at the previous step are taken as starting point to investigate crucial aspects

Operators have to take care not to ruin their privileged relationship with end-users. Indeed some business areas (i.e. advertisement on platforms and location-based services) can be interesting sources of revenues but, at the same time, undermine Operators' relationship with end-users, which is based on trust and loyalty.

7.1 Choosing the methodology

To design an innovative value network model a proper methodology has to be chosen. We have pitched on the *e³value* methodology (Gordijn J. , 2002; Gordijn J. , 2004; Gordijn, Osterwalder, & Pigneur, 2005), which provides modeling concepts for showing which parties exchange things of economic value with whom, and expect what in return. These concepts are based on recent economics and business science literature on e-business combined with formal ontology of systems theory.

Before exploring *e³value* in detail, it is important to point out the motivations behind this choice. This methodology is particularly indicated to develop an innovative value network model due to:

- **Value-oriented approach.** The methodology allows mapping how economic value is created, distributed and consumed a multi-actor network. These characteristics perfectly match the model purpose.
- **Use in academic papers.** *E³value* is widely adopted to represent value networks in different e-business domains. It has been used even in the Mobile services domain as, for example, in the paper by Ballon, Walravens, Spedalieri, & Venezia (2008)**.**
- **Compatibility with platforms theory**. Introducing concepts such as port and interface perfectly suits platform-mediated networks (see 3.1).

E³value is divided into three viewpoints. The most abstract one is the **global actor viewpoint**, which shows actors involved in the network and how they create, exchange and consume objects of economic value. The main concepts are:

- **Actor**: independent economic (and often also legal) entity that makes a profit or increases its utility being in the network[105]. Every actor has a name: company name or a name representing the role such an actor plays.
- **Value Object**: services, products, money (or even consumer experiences) exchanged by actors. It is of value for at least one of the actors involved in a value model. A value object flowing into or out an actor denotes a change of ownership, or a change in rights. From a modeling point of view, the interest is in the kind of value objects and not so much in the actual instances themselves.
- **Value Port**: used by an actor to provide or request value objects to or from his/her environment, which consists of other actors. A value port offers or requests one value object. This concept enables to abstract from internal business processes[106] and to focus only on how external actors and other components of the e-business model can be "plugged in".

[105] This definition is coherent with how the term has been used throughout the investigation.
[106] They can be represented with the Unified Modeling Language (UML).

- **Value Offering**: what an actor offers to or requests from his/her environment. This concept models a set of equally directed value ports exchanging value objects.
- **Value Interface**: an actor's offering to his/her environment and the offering such an actor requests in return form his/her environment. Actors have one or more value interfaces. In the simplest form, a value interface consists of one offering, but in most cases, a value interface groups one in-going and one out-going value offering.
- **Value Exchange**: used to connect two value ports (one in-port and one out-port in the case the exchange is between different actors) with each other. It represents one or more trades of value objects between value ports. There are situations where a port is connected to more than one value exchange.
- **Value Transaction**: consists of one or more value exchanges. In its simplest form, a transaction is between two actors but it can also be between more than two (multi-party transaction).
- **Market segment**: a set of actors that, for one or more of their value interfaces, value objects equally from an economic perspective. Each market segment has a name, in most cases in plural form.

A more detailed approach is offered by the **detailed actor viewpoint**, which shows partnerships (actors who decide to offer and/or request products or services as one virtual actor to/from other actors) and constellations (decomposition of a part of the global actor viewpoint). Consequently, the following concepts is introduced:

- **Elementary and composite actor**: the latter is used to represent partnerships, grouping value interfaces of other actors (in case actors decide to offer objects jointly) and having its own value interfaces to its environment too. The former is used to indicate an actor that does not contain value interfaces of other actors.

Finally, the **value activity viewpoint** illustrates the assignment of value activities to actors. Therefore it is important to describe one further concept:

- **Value activity**: a set of operations that yield profit or should increase economic value for the performing actor. A value activity is performed by exactly one elementary actor but an actor can perform multiple activities.

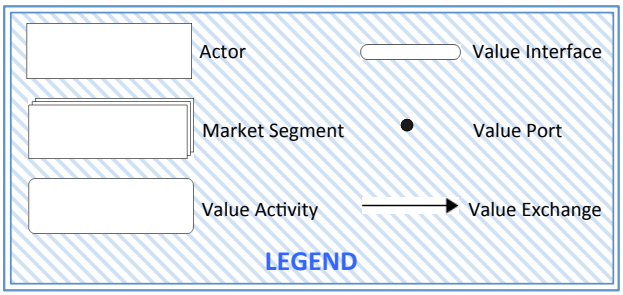

Figure 84 *e³value* ontology: graphic elements

The ontology is able to model operational scenarios too (Gordijn J. , 2004) but his feature is not interesting for the purpose of the investigation.

7.2 Developing the model

Developing the model follows a simple guideline: start with a model as simple as possible and progressively add complexity to it, aiming to obtain a final configuration as similar as possible to the reality.

Before starting with the development, some preliminary considerations have to be done (7.2.1). After this introduction, it is crucial to understand which are the actors involved in the network and how they create, exchange and consume objects of economic value. Assuming the **global actor viewpoint** (7.2.2) perfectly fits with this objective. To achieve a greater degree of detail, value activities have to be described too (7.2.3).

7.2.1 Preliminary considerations

The value network that has to be modeled is a **platform-mediated multi-sided network** (see 3.2.1.1): at its core it has a focal platform (Mobile Services Platform operated by a Platform Provider) that serves more than two groups of users (both user and demand side). This network is **buyer-centric** (see 3.1.1): end-users have the crucial role to pull the value network by creating demand and setting the rules of engagement. Operating in the Open Mobile era, this network is expected to have a **modular structure** (see 1.2.1) and the Platform to be an **open environment** (see 3.2.3.3). Although some other actors (i.e. Service Providers) may be platforms as well, these will be not represented in the model to avoid complexity.

While developing the model, a **neutral approach** will be followed through all the steps (see 7.2.2.1 - 7.2.2.3). This approach consists of analyzing the actors looking at their value contribution, no matter which are the actual companies filling the roles. For example, the **Platform Provider** role (see 3.2.1.3) can be filled by a Device Manufacturer (i.e. *Apple*), a Service Aggregator (i.e. *Facebook*), an OS Manufacturers (i.e. *Google*), a Mobile Operator (i.e. *Vodafone*) and but this is not relevant to develop the model. It becomes relevant to understand Mobile Operators´ opportunities: this topic is analyzed afterwards (see 7.4.2).

For the specific purpose of developing this model, mobile services are re-classified as follows: the term **Connectivity** is introduced to encompass voice services and data services as broadband access and SMS/MMS. **Advertisement** and **Contents** have the same meaning as before (see 1.1.3.).

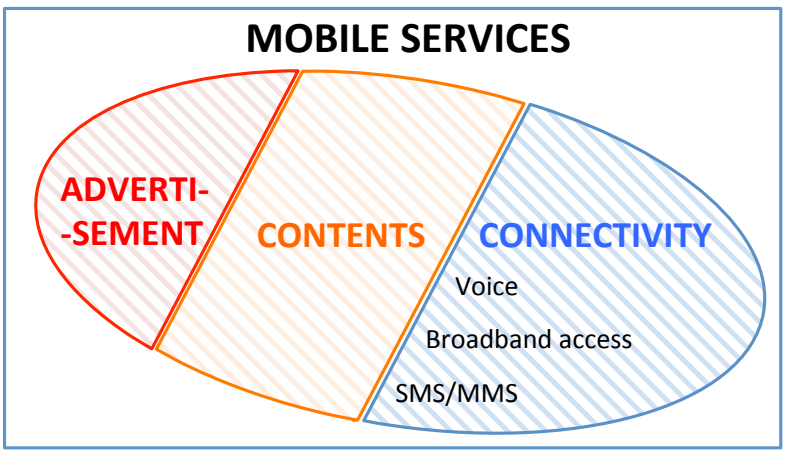

Figure 85 Mobile services re-classification

In most cases, **revenue-sharing contracts** (see 3.2.1.3) are the coordination mechanisms between the Platform Provider and supply-side users (i.e. Service Providers). When this occurs, direct exchange between supply-side users and demand-side users can be omitted, as the platform becomes the focal center of all the exchanges.

7.2.2 The global actor viewpoint

Coherently with the above-mentioned guideline, the model is developed following these steps (Figure 86):

- **Step 1: the core network** (7.2.2.1). This part consists of developing the focal part of the network, modeling the main actors and value exchanges involved in a Mobile Service Platform. The platforms theory applied to the Mobile services domain (see 3.2) plays a crucial role.
- **Step 2: the extended network** (7.2.2.2). The core network is extended encompassing other actors. The value networks theory (see 3.1) gives the most important contributions for this step.
- **Step 3: the innovative value network** (7.2.2.3). Gathering the most important observations coming from the SWOT analysis (see 4) and the case studies, new actors and value exchanges are added to the model.

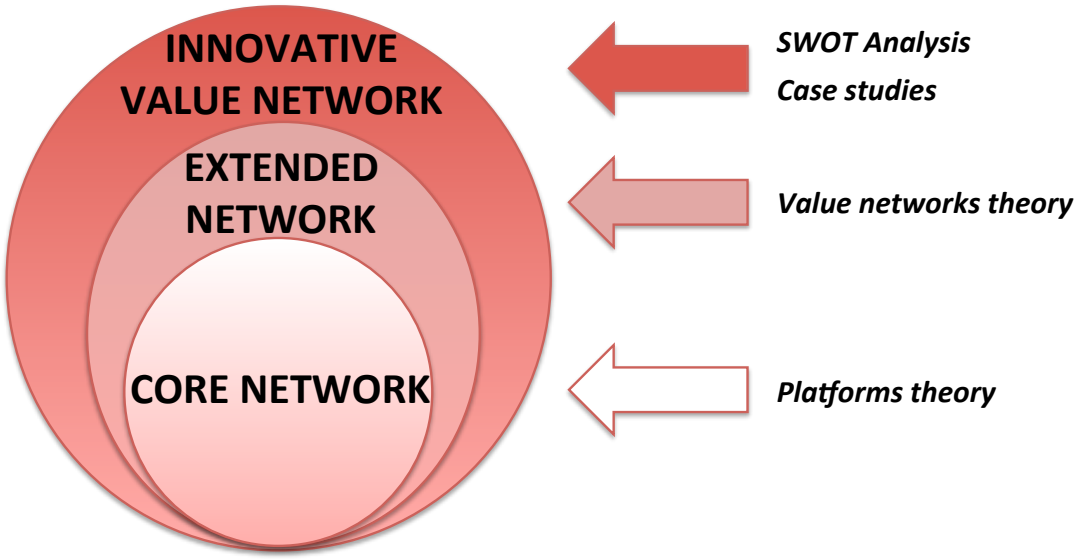

Figure 86 The global actor viewpoint: steps to develop the model.

7.2.2.1 The core network

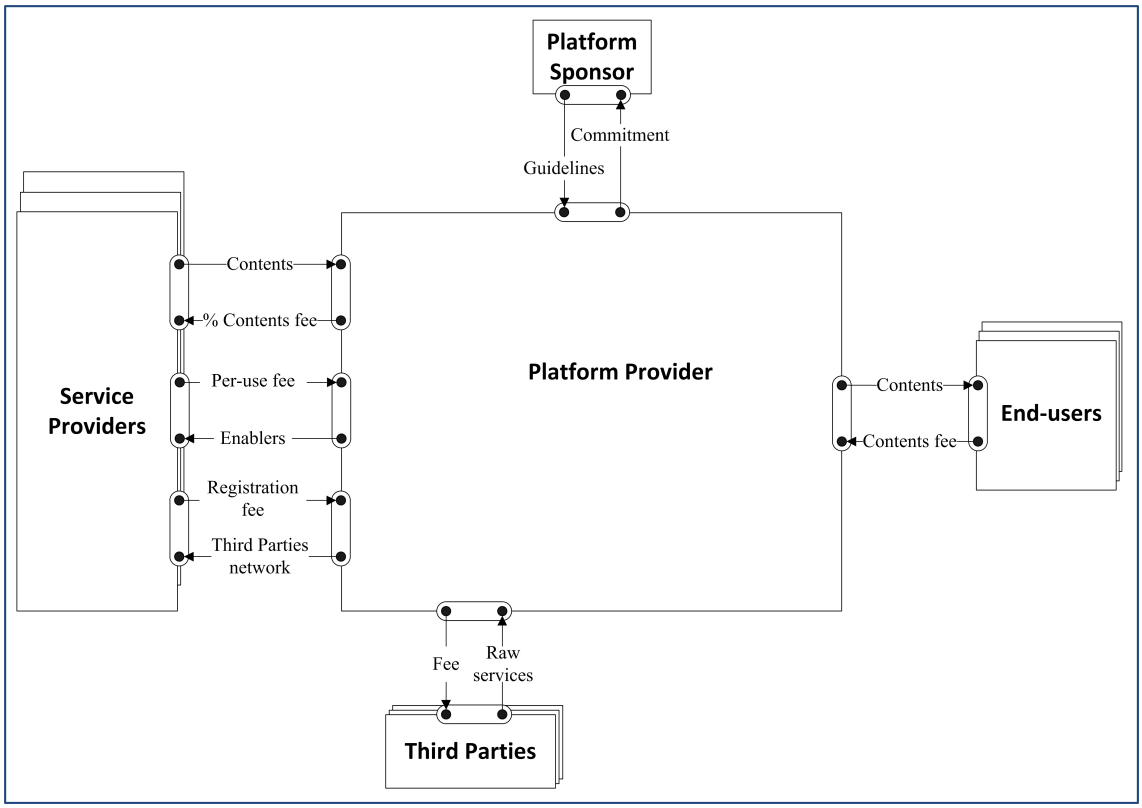

Figure 87 The core network

The core network is composed by the following actors:

- **Platform Provider** (PP) [107]: provides the Mobile Services platform. Operating in a multi-sided network, the PP has value exchanges with all the following actors.
- **Service Providers** (SPs) [107]: professional or semi-professional entities that compose contents (made available on the platform) by creating components and/or recombining and reusing modules. Assuming revenue sharing contracts between Service Providers and the PP, a certain percentage of the fee paid by end-users (% contents fee, described below) goes to the Services Providers while the PP holds the remaining.

  To create components compatible with the platform, SPs need some enabling services (enablers, see 3.2.1.2) made available by the PP. Some of these services may be available for free (i.e. SDK, API) while some others (i.e. sophisticated modules) may have to be paid through a per-use fee. For example, *Telenor´s Content Provider Access* platform offers several non-free APIs (see 5.2.2.4).

  In most cases (i.e. *Apple´s App Store* and *Google´s Android Market* and *RIM´s Blackberry App world*) Service Providers are required to pay a registration fee to be able to publish their contents on the platform. Anyway there are cases (i.e. *Facebook*) where no registration fee is required.

[107] For more details, see 3.2.1.2. In its broad meaning, PP encompasses the role of Platform Operator, Service Aggregator and Portal Provider.

- **Third Parties** (TPs) [107]: work in partnership with the PP to ideate, implement and deploy specific services (raw services, see 3.2.1.2). These services are not directly accessed by end-users but just by the PP, which pays fees (most likely per-use) to Third Parties.

  Most of the Mobile Services Platforms have partnerships with several TPs. Coherently with the *Open Mobile* paradigm and platforms focal role, in most cases the PP makes these partnerships (Third Parties network, Figure 87) available to the Service Providers after the registration. Do these partnerships represent an economic value for Service Providers? Yes, as Service Providers can enrich their own network and have direct contact[108] with qualified Third Parties. As a consequence, new business opportunities can emerge.

  An example is *T-Mobile´s Partner Network* where Service Providers can look for qualified third parties such as Content Aggregators (i.e. *Cellmania, Wireless Developer Agency*), Advertising Providers (i.e. *AdMarvel*, *Nexage*, *Quattro Wireless*), etc. Similar programs are headed by *Orange* (*Orange Partner*), *Telefonica* (*Movilforum*), *RIM* (developers section of *Blackberry App world*), etc.

- **End-users** [107]: consume contents offered by the platform. To access these contents, they pay a per-use or subscription fee (contents fee) to the Platform Provider. Examples of both cases of payment have been already described (see 1.1.3).

  End-users´ role is not just limited to services consumption. Indeed last researches stress the fact that several end-users are not only value receivers, but also co-producers (or **prosumers**) of value (see 3.2.1). To keep the representation simple, this behavior is not modeled. Nevertheless we can imagine that a certain amount of end-users are prosumers and, consequently, they act as non-professional Service Providers, focusing on contents production and publishing on the platform. Thus their behavior could be modeled in a way similar to Service Providers. The importance of prosumers is confirmed even by an executive at *Telecom Italia*: *<<many of these developers are prosumers […], who are really important because they help creating awareness among end-users>>* (Benelli, 2011).

- **Platform Sponsor** (PS)[109]: influences the platform (and consequently the PP) by holding rights to modify the technology, determine who may participate in the network as PP and end-users, etc. These influences are grouped together into a single value object named guidelines (Figure 87). This object has an economic value for the PP because it makes easier controlling and providing the platform and it may imply even lower development costs, etc.

  The PS may be a single company as well as by multiple companies. Even if PS and PP may coincide (i.e. *Apple* in its *App Store*), more often they are separate actors (as represented in Figure 87). In this case, the two actors

[108] While being aware that direct value exchanges between Service Providers and Third Parties may exist, these links are not shown in Figure 87.

[109] For more details, see 3.2.1.1.

are linked together by some agreement defining their collaboration. This agreement expresses Platform Provider´s commitment towards the initiative and the PS. This commitment has an economic value for the PS as it legitimates its role and makes its project available to a bigger audience.

The *WAC* platform (see 5.2.3) well exemplifies this configuration: the project is headed by an alliance that acts as PS for many platform projects, as the ones by *Telecom Italia* (*TIM Store*, see 5.1.1.3) and *Telenor* (see 5.2.2.3) which are the actual Platform Providers (and members of the alliance). The *ST-FP6 SPICE* platform project works in a similar way: a group of companies acts as PS and is responsible for platform architecture, services and business model.

SPs and TPs can be grouped together under the term *complementors* (see 3.2.1.1). Together with end-users, they are modeled as market segments as they represent clusters of actors that value objects equally.

7.2.2.2 The extended network

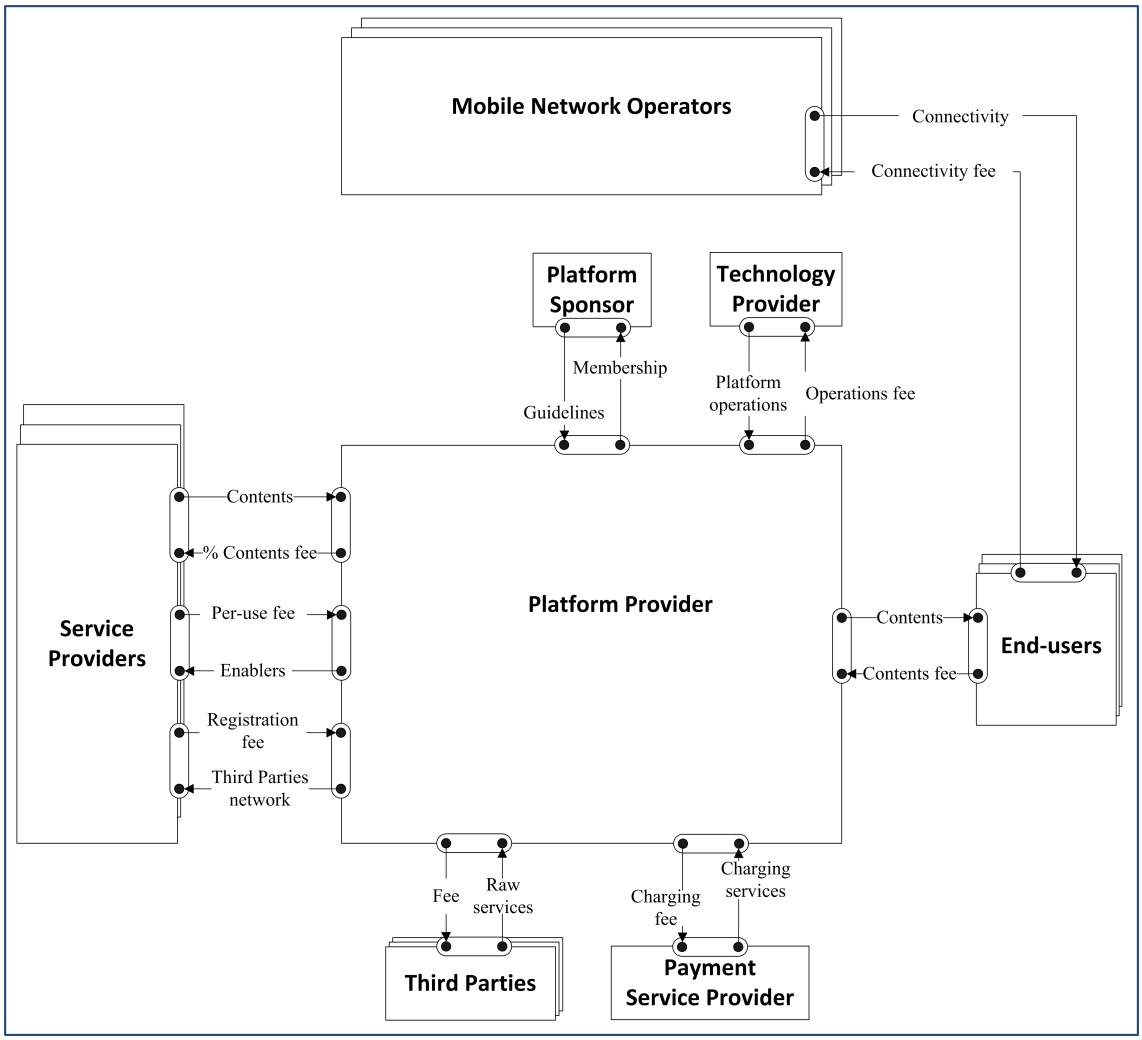

Figure 88 The extended network

The core network has to be extended, as there are more actors involved in the Mobile Services domain:

- **Mobile Network Operators** (MNOs): their role has been widely discussed in the previous sections (see 1.1.1, 1.1.3). Coherently with the mobile services re-classification here adopted (see 7.2.1), MNOs offers connectivity services to end-users in return for a connectivity fee. This fee may be subscription-based (flat data plans, etc.) or per-use (for each call, SMS/MMS, etc.). Most of the Operators offer contents too. Here this link is omitted to keep the model simple.

  In the Open Mobile era, most platforms (even if provided by the Operators, as *TIM Store*, see 5.1.1) are Operator-independent. As a consequence, Operators value platforms and end-users equally. This allows representing them with as market segment in Figure 88.

- **Technology Provider** (TEP)[110]: design and manufacture the platform. Moreover, while the PS gives the guidelines for platform strategy and the PP make the platform available to end-users, the TEP takes care of Hardware/Software solutions to guarantee platform operations (Figure 88) on a daily basis. The PP pays a fee (operations fee) to the TEP in exchange for these services. An example of Technology Provider is *Ericsson,* which supplies a white label store to *Telenor*, for its platform project (see 5.2.2).

  Similarly to what happens with the Platform Provider, the Platform Sponsor may influence the Technology Provider too. Anyway this link has a marginal role and can be omitted.

- **Payment Service Provider** (PSP)[111]: handles charging and billing for the contents available on the platform. Despite many different actors may be involved in the payment process, here this ecosystem is simplified by considering just the PSP. It offers charging services (see Figure 88) to the PP, handling electronic payments by a variety of methods: debit/credit card, electronic wallets as *PayPal*, real-time bank transfer based on on-line banking, phone credit, etc.). The PSP receives a charging fee, which may be set by revenue sharing contracts (i.e. the PSP is given a percentage of the amount charged on users´ credit).

  Different kind of players can act as PSP. For example *AT&T* has recently launched a billing service for *Android Market* named *AT&T Direct Carrier Billing*. With this service, users´ purchases can now easily be charged on the phone credit. Similarly has done *TIM* with *Ovi Store* (see 5.1.1.4). *Google* has an electronic wallet platform called *Checkout* that allows, by storing data on credit/debit cards, to purchase items on different platforms. *Apple* adopts a similar approach for paying on the *iTunes Store* and the *App Store*.

Due to their role, both TEP and PSP can be considered as *complementors*.

[110] The term is used by Ghezzi, Renga, & Cortimiglia (2009).
[111] Another term used in the literature is Payment Provider (Ballon, 2009).

7.2.2.3 The innovative value network

The SWOT analysis conclusions (see 6.5) have highlighted the importance of Advertisement in the Mobile Services domain. Indeed numerous players, as for example *Google, Apple, Facebook*, *Telefonica* and *Telecom Italia*, have been focusing on including advertisement in their platforms and in the contents/applications distributed through it. To develop a model that keeps track of the most important future trends, Mobile Advertisement has to be included too.

To achieve this goal, the simplest way is to add the **Advertisers** to the model. In many cases there might be an **Aggregator** that combines advertisers´ needs and acts as single interface towards the Platform Provider. To keep the model simple, the Aggregator role is omitted and the focus is just on Advertisers, defined as actors interested in leveraging on the mobile channel to promote their products/services. Therefore they take care of advertisement creation and require having their ads in the platform, applications, etc. Advertisers pay a fee (advertisement fee, see Figure 89) to the PP asking for using advertisement space. They are represented with the market segment notation to stress that they are a homogenous group of actors that value objects equally. Advertisers can be classified as *complementors*.

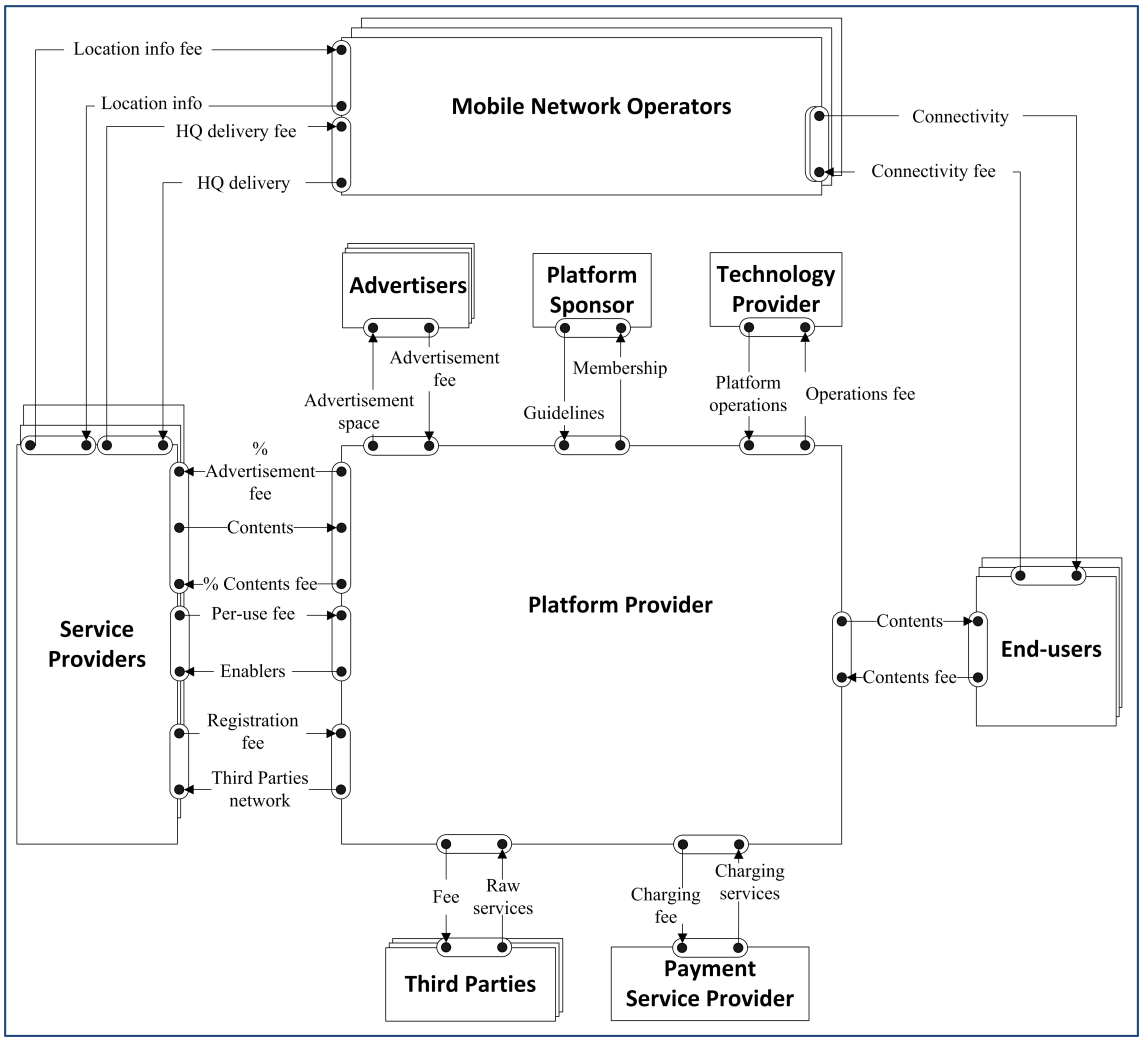

Figure 89 The innovative value network

Beside these exchanges, introducing the Advertisers has other relevant implications:

- **Advertisement fees can be shared with Service Providers**. Platform Provider and Service Providers are already tied up by revenue-sharing contracts (see 7.2.2.1). This relationship can be made even stronger by sharing the revenues coming from the Advertisers (% advertisement fee, see Figure 89 and Figure 90). This approach is one of the corner stones of the new platform by *TIM* (*TIM Store*, see 5.1.2.3).
- **Some services could be presented to end-users for free**. As a consequence of the previous point, Services Providers can have alternative sources of revenues. This allows them to reduce prices in the end-users market and even enlarge their offerings of free contents.

Overall, this scenario leads to a progressive re-configuration of the revenues streams: while contents fees will be lower and lower (and, in an extreme case, even tend to zero), advertisement fees will become more and more important. Both the PP and Service Providers will be affected by these changes, as shown in Figure 90. This idea perfectly fits with the drop in consumers´ willingness to pay for mobile services (see 6.4).

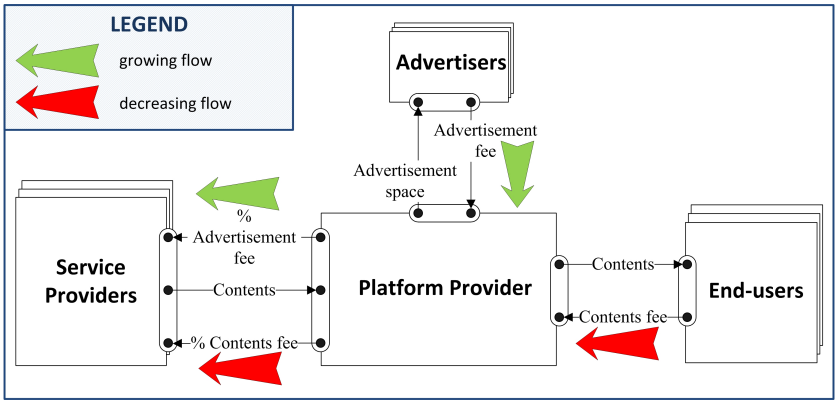

Figure 90 Portion of the network influenced by the introduction of the Advertisers

The SWOT analysis has also stressed the importance of **Location-based services** (LBS) as new way of remuneration for Mobile Network Operators. As stated before (see 6.3), Operators can play an important role in this specific domain by providing positioning services (information about users location; see Location info, Figure 89) to interested parties (i.e. Service Providers), who pay a fee (Location info fee, see Figure 89) to use this information to develop their own services for end-users.

Operators have been approaching LBS in different ways. There are players as *Telenor* (see 5.2.2.4) that have an articulate offering for a wide range of Service Providers (Telenor, 2011a) and others like *Vodafone* (see 5.1.2.4) and *Telia* (see 5.2.1.4) that are willing to offer these services to few strategic Service Providers. The Italian Operator *Wind* is considering LBS services too (see 5.1.3.4). Location-based services are strictly tied with Mobile Advertisement. Together they represent an explosive mix: context-aware advertisement (see 6.5).

As stated before (see 1.3), Operators are discussing about **charging Service Providers** (i.e. *Google* for *YouTube*) for guaranteeing high-quality delivery of their services. LTE performances allow guaranteeing real-time services (see 1.2.7) As confirmed in an interview with a Swedish Operator, this idea (backed by *GSMA*, the association representing interests of Mobile Operators worldwide) is at the center of a huge debate among the players operating in the Mobile Services domain: from one side the Operators willing to stop Service Providers´ "free lunch" and from the other side an heterogeneous group of players fighting against this initiative to defend net neutrality. Which part will prevail is not clear yet even if European regulators are oriented to support Operators in this battle.

It is important to map this trend in the model: Mobile Operators provide High Quality delivery services (HQ delivery, see Figure 89) to interested Service Providers, which pay a fee (HQ delivery fee) to use these services.

7.2.3 The value activity viewpoint

The value activity viewpoint allows illustrating how value activities are assigned to actors. For each actor, just the activities that are relevant in the Mobile Services domain are here described.

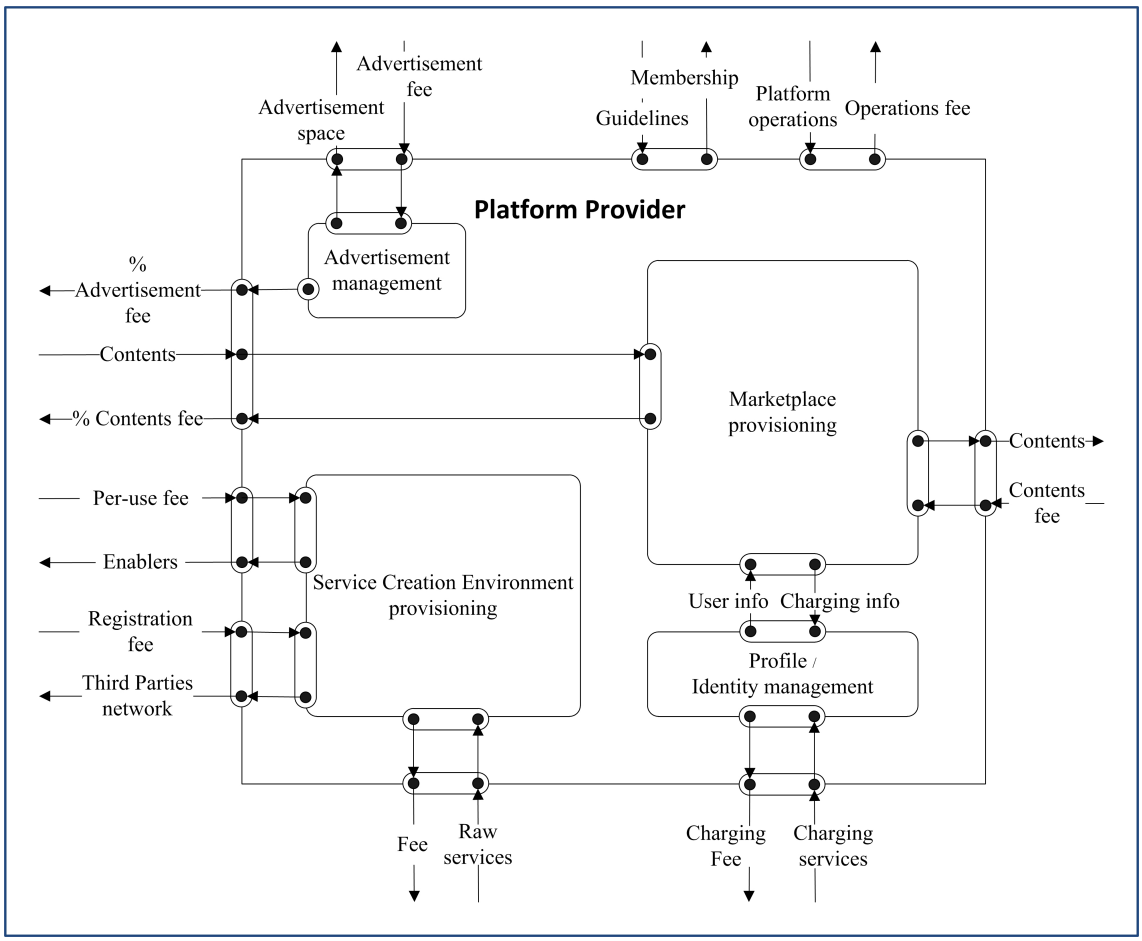

Figure 91 Platform Provider's value activities

The **Platform Provider** performs the following activities (see Figure 91):

- **Service Creation environment**[112] **provisioning**: the PP defines a set of development and hosting tools (enablers, see 7.2.2.1) to help Service Providers developing and publishing contents on the platform. In many cases they have to pay a registration fee (see 7.2.2.1) to access to this environment.
- **Marketplace**[113] **provisioning**: the PP offers an environment where the demand (end-users) can meet the offer (Service Providers). First, this environment offers a front store for end-users to retrieve, subscribe and use mobile services. It can be managed either as a Mobile Portal or as an Application Store (see 1.1.3). Second, it is where Service Providers publish their contents and where transactions[114] with end-users take places.

[112] The term is used by Ballon & Walravens (2008).
[113] The term is used by Goncalves, Walravens & Ballon (2010).
[114] Handled by the PSP.

- **Profile / identity management**[115]: the PP handles general user data and user preferences for various services and for multiple user situations. First, this activity is crucial for the marketplace as it provides precious info (user info, see Figure 91) to improve/tailor the marketplace offering. Second it is important for the PSP as it associate personal info with charging info (see Figure 91) allowing the external actor to provide charging and billing services.
- **Advertisement management** [116] : the PP deals with Advertisers´ requirements and distributes part of the advertisement revenues (% Advertisement fee) to Services Providers according to the revenue sharing contracts (see 7.2.2.3).

This way of mapping Platform Provider´s activities is aligned with the **Platform Gatekeeper** role analyzed before (see 3.2.3.3).

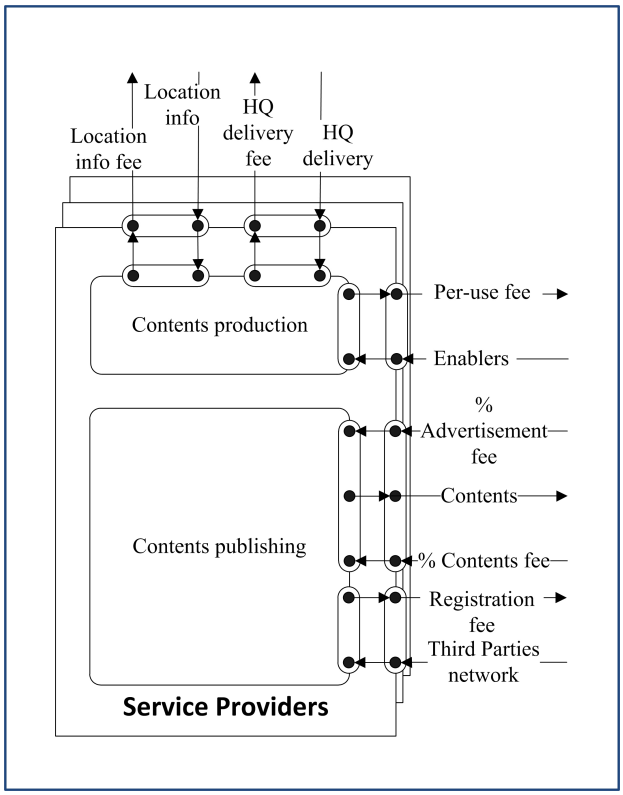

Figure 92 Service Providers' value activities

[115] The term is used by Ballon & Walravens (2008).
[116] Ghezzi, Renga, & Cortimiglia (2009) use the term Advertisement bundling.

After analyzing the Platform Provider, the focus is on Service Providers, whose main activities are:

- **Content production** [117]. Service Providers design and manufacture services using, if necessary, the enablers made available by the PP. Moreover they have to take into account the opportunities offered by positioning services and possible threating initiatives coming from other players (i.e. Operators´ initiatives to stop "free lunches", see 7.2.2.3).
- **Content publishing** [118]. Once the development is completed, the content has to be published on the platform. Setting price and conditions of use for published contents is usually up to Service Providers.

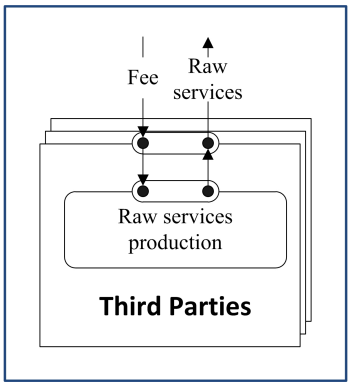

Figure 93 Third Parties´ value activities

Third Parties´ role is easy to model because, as discussed before, their only relevant value activity is **Raw services production** (see Figure 93).

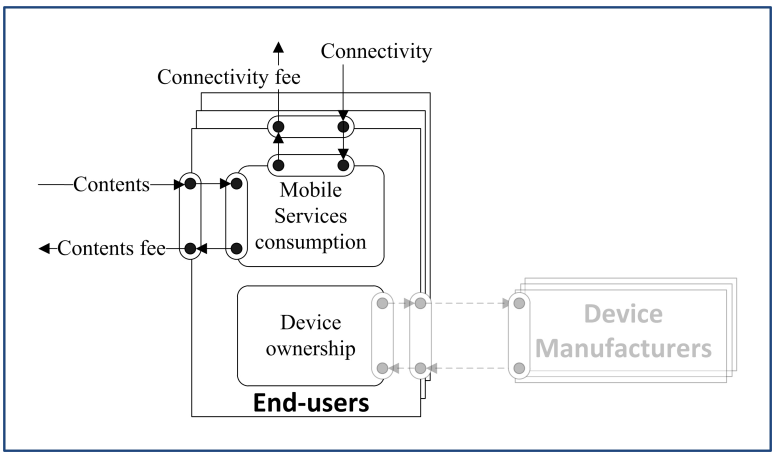

Figure 94 End-users´ value activities

End-users perform the following value activities:

- **Mobile Services consumption** [119]**.** They consume mobile services in form of connectivity (from MNOs) and contents (from the PP).

[117] The term is used by Ballon (2009). Ghezzi, Renga & Cortimiglia (2009) use the term Content creation.
[118] The term is used by Ghezzi, Renga & Cortimiglia (2009).
[119] The term is used by Ballon (2009).

- **Device ownership** [119]**.** To be able to consume mobile services, end-users need to own mobile devices. As shown in Figure 94 this activity links end-users with **Device manufacturers** (DMs)[120], which provide devices to the end-users. Alternatively devices may be offered directly by Mobile Operators through subsidization: Operators buy the devices from the manufacturers and offer them to the end-users in bundle with mobile subscriptions. This approach has reached great popularity during the last years. Due to their complexity, these relationships are not included in the model but the link between end-users and Device Manufacturers is sketched in Figure 94 (grey color and dotted arrows), just to remember that owning a device implies a relationship with another actor (Device Manufacturer or MNO).

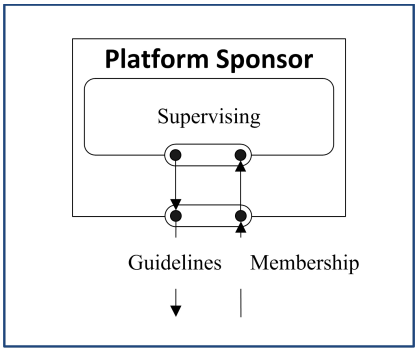

Figure 95 Platform Sponsor´s value activities

The Platform Sponsor is easy to model too as its role is about **supervising** the platform and Platform Provider´s operations.

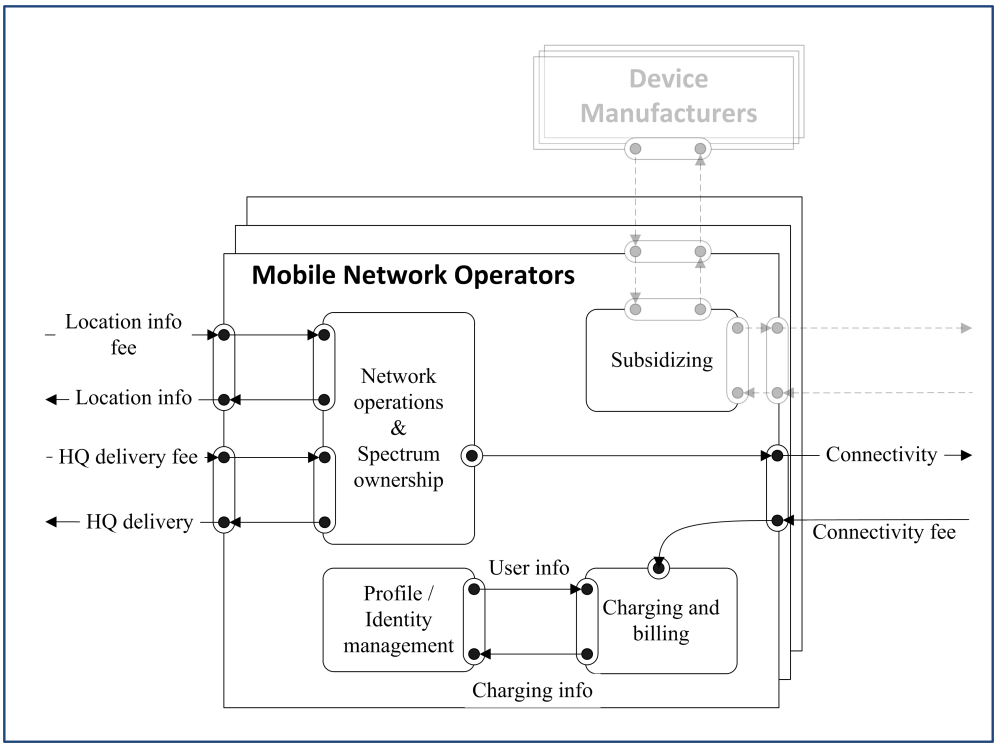

Figure 96 Mobile Network Operators´ value activities

[120] The term is used by Ballon (2009), Pagani & Fine (2008), Goncalves, Walravens & Ballon (2010).

Mobile Network Operators perform the following value activities:

- **Network operations & Spectrum ownership** [121]. Mobile Network Operators manage the physical network infrastructure: antennas, base stations and core network. Spectrum ownership (see 1.2.7.2) allows Operators to run their over-the-air network operations. These activities can be considered separately but, being complementary and mutually dependent, are here grouped together. Both are essential to offer connectivity to end-users and any other network-related service.
- **Charging and billing** [122]. Charging implies collecting data to enable monitoring of resource usage, accounting, and/or billing. Billing is about issuing bills and arranging for collection of payments from customers, either through prepaid or post-paid solutions. Therefore this activity handles connectivity fees coming from end-users (see Figure 96) but it may take care of accounting and dividing the revenues among the actors involved in offering the service (this link is here not explored here to keep the model simple).

  As discussed before (see 7.2.2.2), a Mobile Network Operator can act as Payment Solution Provider, deploying its charging and billing capabilities to offer charging services on users´ phone credit to interested actors (i.e. the Platform Provider). This link is here omitted to keep the model simple; anyway this behavior can be easily modeled replicating the same approach used for the Payment Solution Provider. Further considerations are done later (see 7.4.2). Attracted by revenue sharing opportunities, Operators are looking at these services with great interest. *TIM*, which has recently launched an initiative with *Ovi Store* (see 5.1.1), stated that *<<We are very open to set billing contracts>>* (Benelli, 2011). Roberto Forte (2011) at *Tre Italia* is on the same wavelength: *<<We are expecting a growth in our billing services for external actors>>.* This position is shared by another Italian Operator (*Wind*) and also the by the Swedish Operator we have interviewed.
- **Profile / identity management** [115]. Thanks to customer care services and large and consolidated customer base, Mobile Operators manage a lot of information about network usage. This activity works in combination with the charging and billing activity: the former receives charging info (see Figure 96) from the latter that is provided with complete user info, crucial for the billing. Despite the activity is named as the one carried out by Platform Providers, its scope is different: while the former deals with data about platform usage the latter handles information about network usage. Therefore the activities are complementary and not substitute.

These four activities represent Operators´ most crucial assets and they are all required to provide connectivity services to end-users. Anyway, to complete Mobile Operators model, another value activity has to be considered:

[121] The term Network Operations is used by Ghezzi, Renga & Cortimiglia (2009); Ballon (2009) uses the term Backbone network operations.The term Spectrum ownership is used by Ballon (2009).
[122] The term is used by Ghezzi, Renga & Cortimiglia (2009) and by Wulf, Zarnehow & Duser (2007).

subsidizing[123]**.** As described before, Mobile Operators are used to subsidize end-users´ devices purchase creating bundles device/subscription. Subsidization implies that Mobile Operators have a value exchange with Device Manufacturers (they buy devices from them) and an additional value exchange with end-users (Operators´ offering towards end-users is richer because it encompasses devices too). Operators strategy with devices is clear, as confirmed by *Vodafone Italia*: *<<We are not device sellers and selling mobile phones is not and will not ever be our core business. Therefore devices have to be coupled with a price plan, support, applications, a call center to handle customers' problems, shops where people can get help. […] It has to be an integrated proposition that goes beyond the device >>* (De Carlo, 2011). To keep the model simple, both these links are omitted but they are sketched in Figure 96 just to remember they exist.

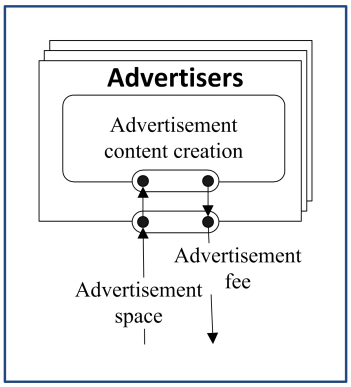

Figure 97 Advertisers' value activities

Advertisers are really easy to be modeled, as their main activity is **Advertisement content creation**[124]: the set of operations to create an ad from scratch. Once completed, the advertisement is handled by the Platform Provider, which takes care of integrating it with the platform and the contents distributed over it.

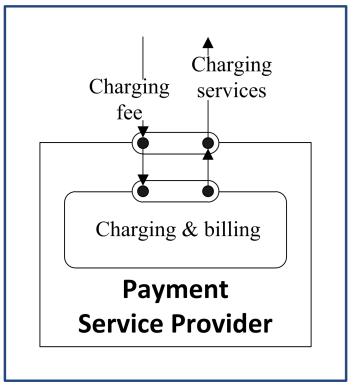

Figure 98 PSP's value activities

The Payment Service Provider's main value activity is **Charging & billing** [124]. It works exactly like Mobile Network Operators' charging & billing activity with one distinction: Mobile Operators are able to handle charging on users phone credit while other PSPs not (or better: they need anyway some deal with MNOs to be able

[123] The term is used by Ballon (2009).
[124] The term is used by Ghezzi, Renga & Cortimiglia (2009)

to handle it). As shown in Figure 98, the PSP offers charging services to the PP who pays a fee (charging fee) for them. The fee may be based on revenue sharing deals.

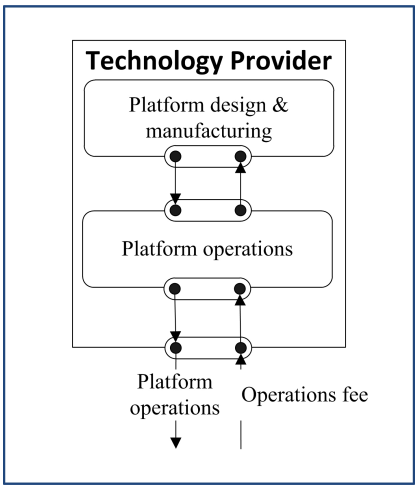

Figure 99 Technology Provider's value activities

The Technology Provider carries out the following value activities:

- **Platform design & manufacturing** [124]. Designing and manufacturing the middleware: the software that includes platform main services, allowing interactions with Service Providers and end-users.
- **Platform operations** [124]. Granting platforms operations through hardware and software solutions on a daily basis.

7.3 Comparing with existing models

To understand how Mobile Services Platforms operate in the value network, 23 papers have been selected and analyzed (see 3.2.2). Two of these contributions describe value network models that are interesting to compare with the model previously developed (see 7.2).

The first paper (ID 03, see 3.2.2) is by Ballon, Walravens, Spedalieri, & Venezia (2008). Using the *e³value* ontology (see 7.1), the authors develop a theoretical draft for an Advertisement-based value network model where gatekeeping roles (see 3.2.3.3) are balanced among the different actors, who all add value to the ecosystem. As shown in Figure 100, the Network Operator provides not only connection to the end user, but also valuable information such as user context to a third-party platform. This platform is operated by the Platform Manager, which can provide the user with services and pieces of information that are adapted to his environment, preferences and behavior. Since an Advertiser is involved, some services could be presented to the user even for free because the Service Provider generates revenue by selling advertisement space and in turn users accept advertisements.

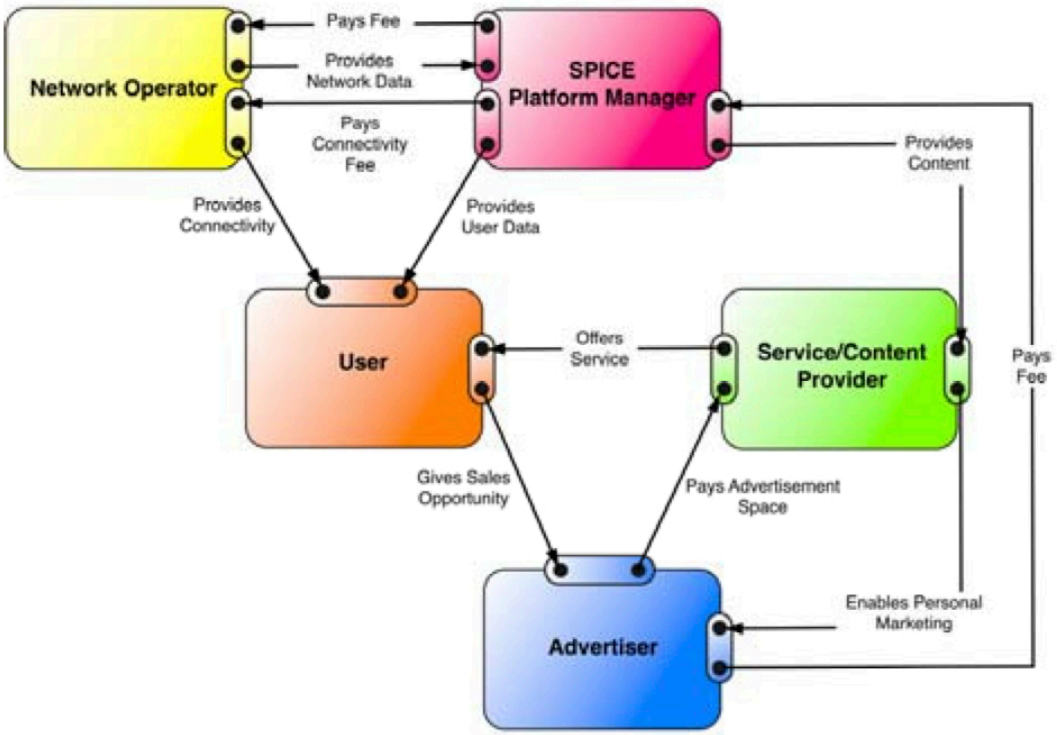

Figure 100 Advertisement-based model. (Ballon, Walravens, Spedalieri, & Venezia, 2008)

Fostering the exchange of information between customers and the Network Operator is a critical foundation for the model. It can be expected that users will be willing to disclose personal information only if they gain a significant enhancement of their user experience. The user data will be sent over the network owned by the Network Operator so the user will generate traffic (paid by the Platform Manager, which acts as context provider). The Platform Manager needs to broker the information from the context enabler (the Network Operator) in order to sell his context to the Service Provider and therefore he is likely to be willing to pay the traffic generated by the user.

The second paper (ID 09, see 3.2.2) is by Ghezzi, Renga & Cortimiglia (2009). The authors develop four value network scenarios, allocating value activities within actors´ domain in four different ways. Looking at the trends arising in the Open Mobile era (see 1.2.1), the most interesting configuration is the so-called "Full open garden configuration", which takes to the extremes the trend of openness towards third parties, reshaping the network structure to a point where the substitution of the Mobile Operator as focal firm occurs.

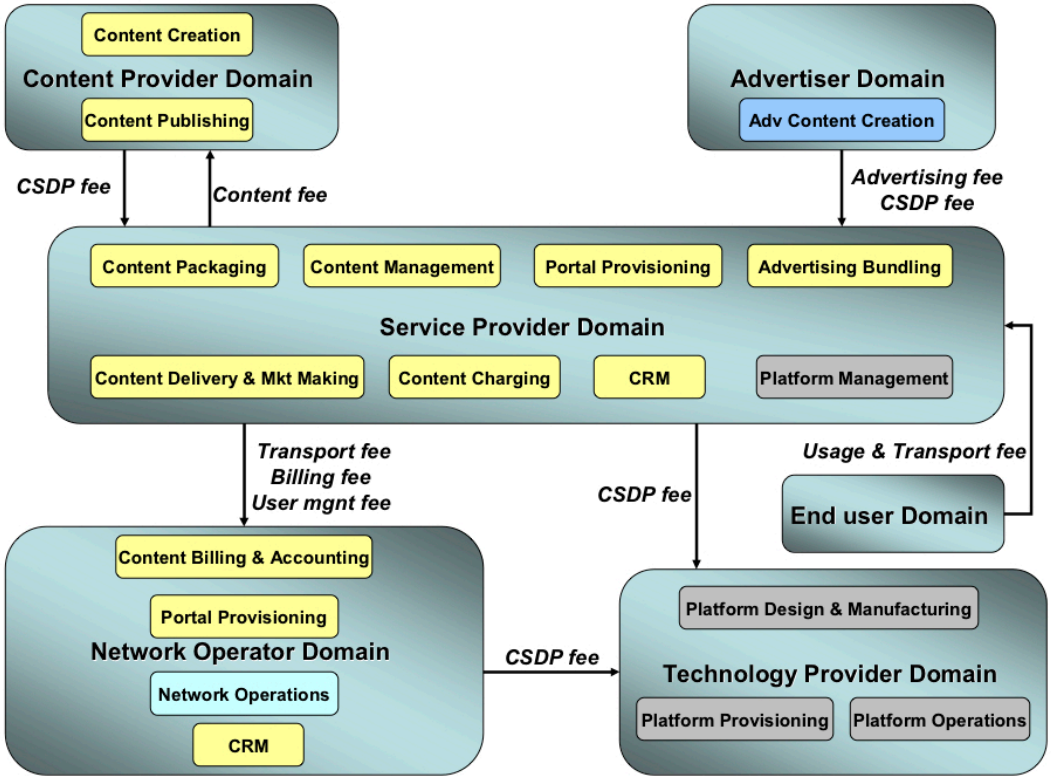

Figure 101 Full open garden configuration. (Ghezzi, Renga, & Cortimiglia, 2009)

The Service Provider replaces the Operator as network focal, substantially relegating the latter to the role of carrier and network manager. The model shows how revenue streams flow from one actor to the other. The Service Provider (here described as the actor taking care of the overall management of contents and services) pays a fee to Content Providers (creators of digital contents) for the exploitation of their contents and pays a fee to the Technology Provider for the provision of the platform. Moreover it receives direct revenues from the Advertisers (for the enablement of their campaigns on the Mobile channel) and from end-users. A consistent part of these revenues coming from content commercialization is redirected to the MNO for the provisioning of the network infrastructure and other network-related services. Looking at network dynamics, the Service Provider may try to overtake Contents Providers position by acquiring core competencies related to content creation. Moreover Service Providers could be interested in stealing the know-how necessary to design and operate a middleware platform to exploit it for their exclusive benefit, and afterwards breaking the alliance.

As we can see, both papers deal with many of the aspects encompassed in the model here developed. To evaluate differences and similarities among the three models, the following variables are evaluated:

- **Number of relevant actors.** The number of actors described in the model allows understanding how the value network is represented: this is the criterion used before (see 3.2.2.1) to classify the scientific papers about Mobile Services platforms. Here this guideline has to be refined as looking just at the number of actors is not satisfactory: actors have to relevant for the platform (i.e. have value exchanges with it). The first paper lists five actors (all connected to the platform), focusing on value objects (see 7.1). The second contribution includes six players all plugged in the platform; revenue streams play a crucial role in the representation. The model here developed includes nine relevant actors exchanging value with the platform. Value objects are the focal point of interest, as in the paper by Ballon, Walravens, Spedalieri & Venezia. Including Device Manufactures (just sketched in the model, see 7.2.3) would increase the number of actors to ten: this would be pointless because these actors are not relevant as they are not connected to the platform.
- **Type of actors.** Looking at the type of actors, each author use different terms and different meanings for the same term. Disregarding this aspect, it is important to point out that all the models consider Advertisers among the relevant actors. In the model by Ghezzi, Renga & Cortimiglia there is no Platform Provider as all the platform-related activities are associated to the Technology Provider relegating platforms to a more technical role. This approach is different from the one used in the other papers, which depict platforms as technical as well as organizational entities.
- **Value activities.** The first paper does not include value activities. On the contrary, Ghezzi, Renga & Cortimiglia identify sixteen value activities (which are classified into three parallel but interconnected layers) as first step to develop their model; the second step is to describe the actors; subsequently the activitities are recombined among the actors to obtain the above mentioned four value network scenarios. The model here developed follows a different approach: first the actors are identifies and then, for each actor, the most relevant value activities are described. Overall the model encompasses eighteen value activities (see 7.2.3).
- **Revenue sharing contracts.** Despite this kind of contracts has become more and more diffused in the Mobile Services domain none of the two papers comprises revenue sharing deals. On the contrary, the model here developed shapes the relationship between Service Providers and Platform Providers after these contracts (see 7.2.2).

Besides these considerations, it is also important to point out that the model developed by Ballon, Walravens, Spedalieri & Venezia is mostly theoretic: no real-life examples are described to support it. On the contrary, this investigation follows a different approach: the model is shaped not only after a strong theoretical background but also after current trends in the Mobile Services domain. Moreover actors description is enriched by real-life examples, and contributions coming from interviews, etc.

7.4 Drawing conclusions

First, it is interesting to assess which is the impact on the current academic knowledge of the Mobile Services domain (7.4.1). Second, we explore how the model contributes to analyze current and future strategic challenges for Mobile Operators in a structured way (7.4.2).

7.4.1 Impact on the academic knowledge

The model is a significant contribution to the knowledge of how the Mobile Services domain can be mapped as a value network. Its main value is to be:

- **Complete.** The model represents all the actors and value activities that are relevant in the Mobile Services domain. Assuming the number of actors and value activities as main variables, similar contributions are not as complete as the model here developed. This aspect has already been discussed before (see 7.3) and the main evidences are summarized in the table below.

Model	Actors	Value activities
Ballon, Walravens, Spedalieri & Venezia	5	N/A
Ghezzi, Renga & Cortimiglia	6	16
The innovative value network (see 7.2)	9	18

Table 13 Number of actors and value activities: comparison among the models.

- **Platform-oriented.** The model is shaped after Mobile services platforms. Traditional platforms theory has been adapted to the Mobile Services domain (see 3.2). As a result, the platform holds the focal position in the network and the other actors have been progressively attached to it (see 7.2.2). This approach is perfectly aligned with the ongoing trends in the Mobile Services domain where platforms are flourishing more and more at different layers: OS, service management and web-based services (see 3.2.3).

Keeping these considerations into account, it is interesting to imagine how the model here developed could be positioned in comparison with the 23 most interesting academic contributions before analyzed. Following the same methodology and graphical representation, two are the variables to take into account: **number of actors** (nine are the actors encompassed by the model) and **platform complexity** (being platform-oriented, the model gives a wide and complete definition of platform). The results are shown in Figure 102. No extra comment is needed about the first variable (number of actors), while it is important to explain how platform complexity has been measured. All the papers define platforms in an excellent way (★★★, see 3.2.2.1). As stated before (see 7.3), there is a small distinction among them: while Ghezzi, Renga & Cortimiglia (2009) focus more on platforms technical aspects, the paper by Ballon, Walravens, Spedalieri & Venezia (2008) describes platforms more accurately, taking into account both technical and organizational entities; the model here developed follows the same approach. This is the reason why the last two hold a better position in the chart.

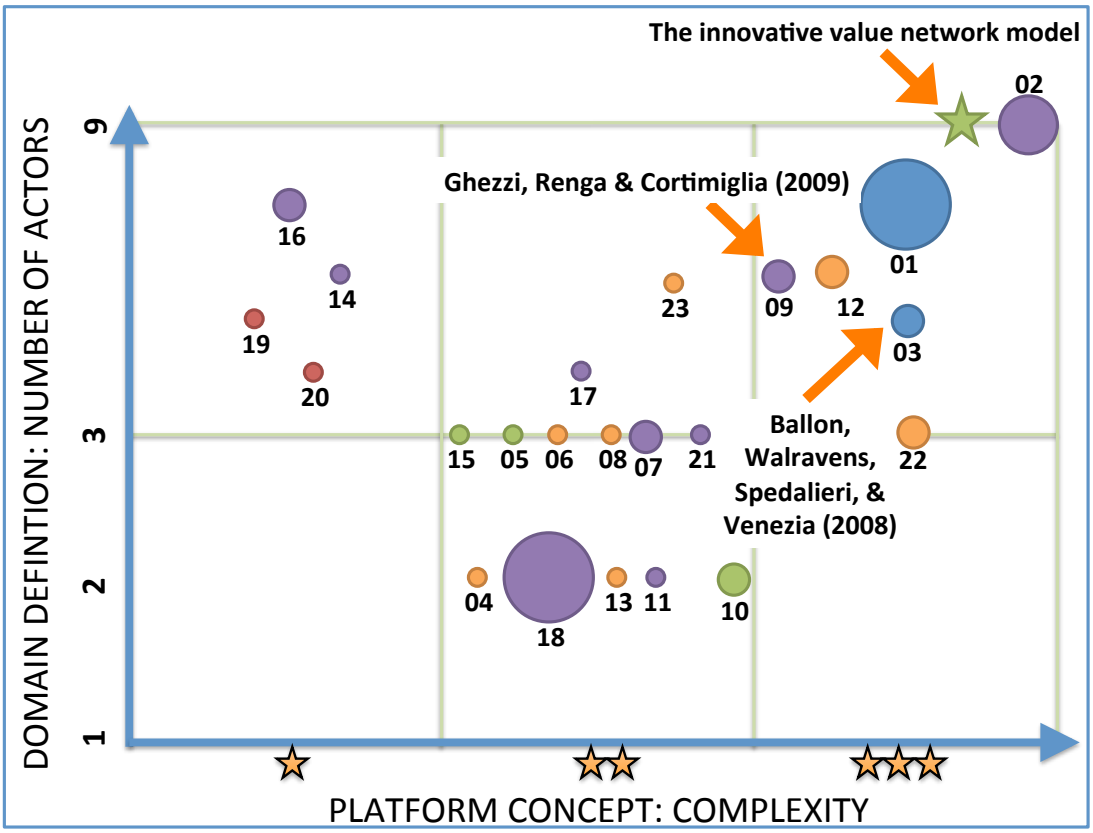

Figure 102 Papers classification. How the innovative value network model can be positioned

Besides these aspects, model biggest contribution is to be **innovative**, in the sense that it tracks new ways of cooperation among actors involved in the value network. An example comes from revenue sharing contracts between Service Providers and the Platform Provider, where not only revenues from contents bur also from advertisement are mapped (see 7.2.2). Another scenario involves high quality delivery services, which may be offered by the Operators to Service Providers who require high data rates for their services. In addition, many opportunities come from Location-based services that trigger a virtuous cycle: Operators can monetize their network infrastructure in a different way by selling these services to interested parties, Service Providers can develop more advanced services thanks to positioning technologies, Advertisers have further incentives to invest in the mobile channel thanks to the possibilities offered by context-aware advertisement, etc. These aspects constitute the link with the next topic: exploring how the model can help to identify Operator's current and future challenges in the Mobile Services domain (see 7.4.2).

7.4.2 Mapping Operators' strategies

The model here developed allows mapping Operators strategic challenges that have been described in the investigation. All the modeled strategies are listed and discussed referring to the case studies to check their validity and implications on the market.

These challenges are listed highlighting model elements (actors, value activities and value objects) that are involved (7.4.2.1). Platform strategies have an important role in Operators´ future and therefore are handled separately (7.4.2.2).

7.4.2.1 Strategies for the Mobile services domain

The first challenge consists of **investing in the network, optimizing the traffic and dealing with band auctions**. The main goal is to defeat network congestion (see 6.2) by upgrading existing 3G networks (i.e. with the HSPA+ technology as done in Italy, see 2.1.2), developing new 4G networks (i.e. LTE technologies in Europe, see 1.2.7.1, 2.2.6) as well as focusing on new codecs to optimize the traffic (see 2.1.2). Band auctions (see 1.2.7.2) are strictly correlated to investments in network infrastructures: acquiring 4G frequency slots at lower bands (i.e. 800 MHz) allows having better coverage and thus reducing base stations investments. Looking at the model, the main implications are mostly internal (to the Operator), focusing on the Network operations & Spectrum ownership activity (see Figure 96). Of course, higher network performances have positive effect on many other actors in the network, enabling new and sophisticated services, as discussed below.

Looking at the case studies, we see that Scandinavian players (*Telia* and *Telenor*) are already operating 4G networks in Sweden and have recently purchased frequency slots at 800 MHz. Italian Operators are moving in two groups: the former is composed by *TIM* and *Vodafone* that have a clear roadmap for 4G and the latter is composed by *Wind* and *Tre*, whose future plans are less clear.

Operators have another important challenge: decide if **to charge Service Providers for HQ delivery services** (see 7.2.2.3). This initiative goes towards defeating network congestion by stopping Providers´ "free lunches" an it is strictly related to the above challenge as high performances achievable with 4G networks make it technically feasible. Beside technical aspects, this idea has been widely debated for the last months as it might compromise net neutrality (see 1.2.8). This trend is represented by two value objects (HQ delivery and HQ delivery fee) exchanged between MNOs and Service Providers. The latter will have to take this trend into consideration while designing and manufacturing the contents (Contents production activity): they have to be aware that if their contents require high quality delivery (i.e. Video-on-Demand services) they might have to pay for it.

Due to its nature, this strategy is identified but kept as mere hypothetical plan for the future. Important confirmations come from the case studies, highlighting that the topic is widely discussed inside the companies and within the Operator.

To deal with network congestion, Operators are working on another front: to introduce **new data price plans for mobile customers**. The idea is to segment the market as much as possible and tailor price plans on these segments by introducing unlimited plans (with different speed/data guarantees) and setting apart data plans based on hours/amount of data. The Italian Operators as well as

the Swedish Operator we have interviewed are working in this direction, which is crucial for them but quite marginal for this investigation, which is more focused on challenges that can move/evolve the whole value network. The only actors affected by this move are end-users (Mobile services consumption value activity), who will have to pay different connectivity fees for data traffic.

Important confirmations of this approach come from *Vodafone* (whose strategy is to heavily segment the market and tailor price plans on these segments, see 5.1.2.4), *Wind* (see 5.1.3.4) and *Telia* in Sweden (see 5.2.1.4). *TIM* is not running at the same pace as it has not yet abandoned old-style price plans and still offers data plans charging users per hour (see 5.1.1.4). *Tre* is adopting approach similar to *TIM*, offering both unlimited and per hour data price plans (see 5.1.4.4).

Another big challenge for Operators is represented by **Location-based services**, which can be a new way of remuneration for Mobile Network Operators (see 7.2.2.3). The technical need for an alternative to GPS and the high precision reachable with LTE technologies push Operators to offer information about users location to interest Service Providers, which develop the actual location-based services. This challenge is mapped in the model by introducing two value objects (Location info and Location info fee). The main impact is on the Contents production value activity as Service Providers, while designing and manufacturing the contents, can think about integrating positioning in their services.

There are some Operators that have already a proper and wide offering of positioning services as *Telenor* (see 5.2.2.4). Some others are approaching this business, i.e. offering their own navigator service (as *Vodafone*, see 5.1.2.4 and *Telia*, see 5.2.1.4). *TIM*, *Tre* and *Wind* do not offer any positioning services yet.

As widely discussed before (see 7.2.3), providing **charging services** to interested parties is one of the areas where Operators are working the most. Driven by important revenue sharing opportunities, they are looking for signing deals with a wide range of actors in the following domains: mobile services, public transportation, food and beverage vending machines, etc. Coherently with the objective of this investigation, the focus is restricted on the Mobile Services domain and, more specifically, on charging services towards Mobile Services platforms. The model maps this challenge assuming that the Mobile Network Operator takes over the Payment Service Provider role too [125]. Therefore Operator´s behavior is going to be the same at the Payment Service Provider (see 7.2.3): using its charging & billing capabilities (coupled with Profile/Identity management), the Operator is able to offer charging services to the Platform Provider in exchange for charging fee, (Figure 103).

All the Operators analyzed look at charging services as an extremely interesting business opportunity. *TIM*, *Vodafone*, *Wind* and *Tre* are involved in a joint payment platform initiative (see 2.2.5). Besides this project, every Operators aims at developing specific deals with Service Providers (i.e. the deal between *TIM* and the *Ovi Store*, see 5.1.1.4). *Telenor* has a very rich offer (trough it CPA platform, see 5.2.2.4) as well as *Telia* (see 5.2.1.4).

[125] The Mobile Network Operator may be not the only Payment Services Provider, as the Platform Provider may need other actors, to deal with other payment solutions (i.e. credit/debit card).

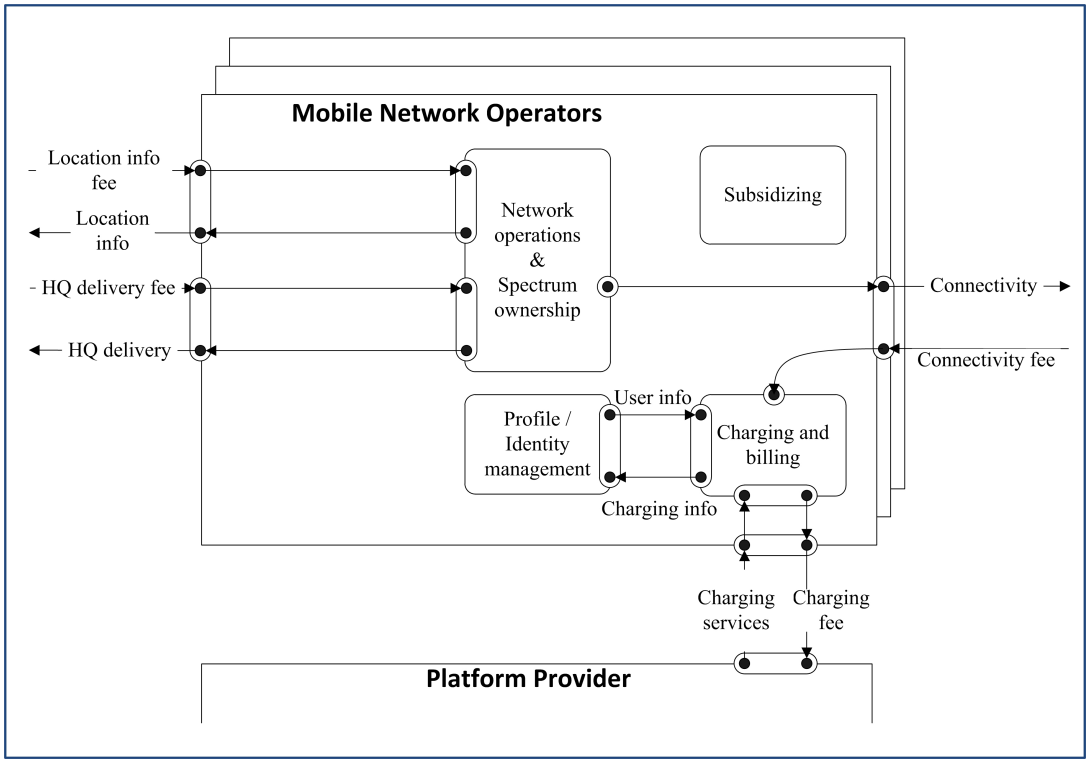

Figure 103 MNOs take over the PSP role

All the above considerations about challenges for Operators in the Mobile Services domain are summarized in the following table.

Strategic challenge	Driver	Internal perspective	External perspective: impact on the network		
		Value activities	Actors	Value activities	Value objects
Network upgrade, optimization & spectrum auctions	Network congestion	Network operations & spectrum ownership	-	-	-
Charge for HQ delivery services	Network congestion	-	Service Providers	Contents production	HQ delivery, HQ delivery fee
New data price plans for mobile customers	Network congestion	-	End-users	Mobile Services consumption	Connectivity fee
Location-based services	Revenues	-	Service Providers	Contents production	Location info Location info fee
Offer charging services to interested parties	Revenue sharing contracts	Charging and billing (MNO takes over the PSP role)	Platform Provider(s)	Profile / identity management	Charging services, Charging fee

Table 14 Challenges for Operators

7.4.2.2 Platform strategies

Operators have to evaluate which strategy to adopt with Mobile Services platforms. The model has been developed following a "neutral" approach (see 7.2.1); it is therefore interesting to evaluate an Operator-centric scenario where Operators have an active role with Mobile Services platforms. Looking at current behaviors, three are the possible strategies:

- **"The parachute": to update the mobile portal.** This strategy consists of updating Operator´s mobile portal (re-styling, re-organizing contents, etc.) and making it accessible by smartphones and tablets too. It is a vertical platform strategy (Eisenmann, Parker, & Van Alstyne, 2008) that has been named "The parachute" to stress that this is a short-term strategy aiming just to obtain revenues from traditional contents that can be still considered as cash cows. This strategy is not mapped in the model as it refers to an "old-style" view to deliver mobile services (see 1.2.1) that does not fit the Open Mobile era and the increasing adoption of smartphones. Anyway the following considerations can be done: besides connectivity, Operators offer contents directly from their portal enriching their offering towards end-users (with impact on the Mobile services consumption value activity). Services are delivered in collaboration with external Providers that, in most case, have had long time business relationships with the Operator.

  Looking at the case studies, this strategy is well represented by *Tre*, which is just focusing on updating its old mobile portal (see 5.1.4.3). *TIM* (see 5.1.1.3), *Vodafone* (see 5.1.2.3) and *Wind* (see 5.1.3.3) are willing to keep alive their mobile portals but at the same time they are running other interesting projects. On the contrary *Telia* (see 5.2.1.3) and *Telenor* (see 5.2.2.3) have completely discarded the old portals.

- **"Cooperation": to integrate with other platforms**[126]. This strategy consists of collaborating with other actors to play a meaningful role in the Mobile Services domain without direct investments to develop a platform. It is an horizontal platform strategy (Eisenmann, Parker, & Van Alstyne, 2008) that, even if does not bring immediate revenues, it allows Operators to be present in an important and growing business area by accessing to platform´s customer base and, in the future, to offer charging services to the PP (see 7.2.2). Two are the possible scenarios:

  - **Create branded stores within existing platforms**. Operators can act as aggregators and open branded stores within existing platforms, as exemplified by *Wind* on the *Android Market* (see 5.1.3.3). Operators do not have specific deals with the PP and Service Providers (which maintain the same relationship described before, see 7.2.2): their job is to aggregate and certify contents and services. The main effect is on end-users (Mobile Services consumption value activity, see 7.2.3): they can access to an environment where choosing contents and services is simpler (the Operator scan contents and services, selecting the most interesting ones) and safer (contents are certified by Operators).

[126] A similar strategy is described in the paper by Eisenmann, Parker, & Van Alstyne (2008).

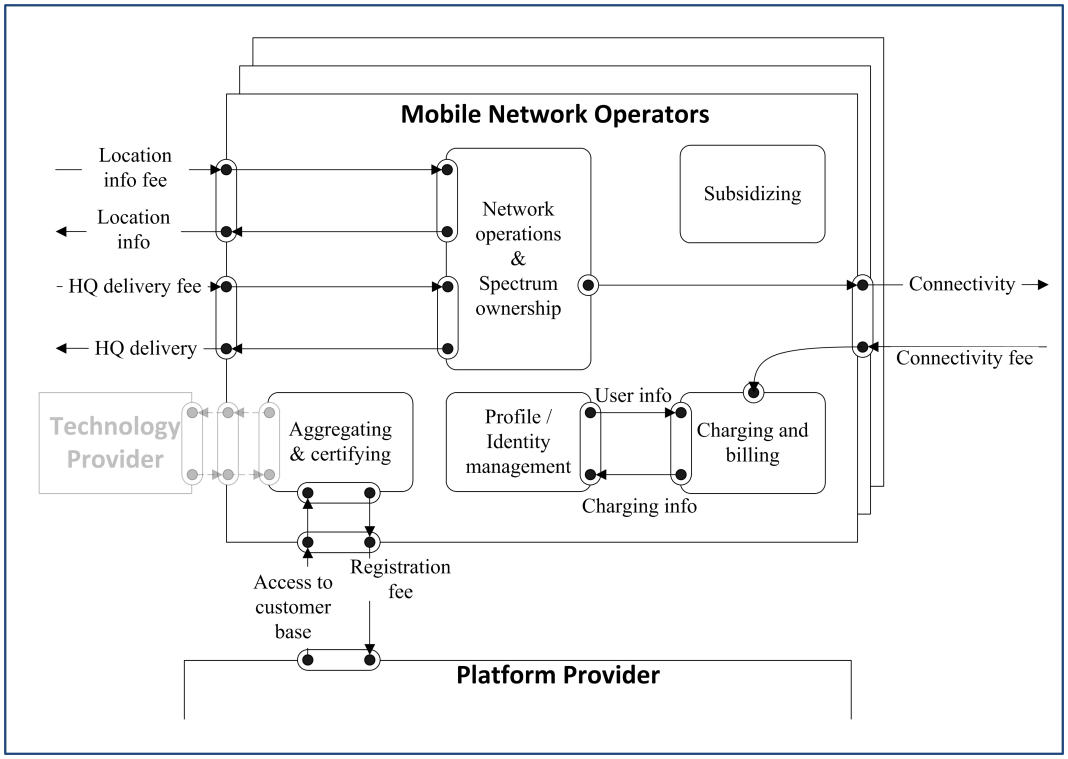

Figure 104 MNOs act as Aggregator

This strategy can be mapped by doing a small addition to the model. Besides what mentioned above (see 7.2.3), Operators have one more value activity (Aggregating & certifying, see Figure 104), which consists of selecting a set of contents and services, certifying them and making them available on a specific environment linked to the existing external Platform. To do this, the Operator needs to register to the Platform (as any other Service Providers paying a Registration fee, see Figure 104) having in return the possibility to have access to platform´s customer base and in particular to those subscribers who are active using services and contents available on the platform.

Operators may even develop an ad-hoc environment so that their subscribers can easily access to the branded store (i.e. a website that is linked to the platform and accessible through a mobile application). To do this they may involve an external actor (i.e. a Technology Provider). Anyway this link has a marginal role and therefore it is only sketched (see Figure 104).

- **Collaborate with Platform Providers to bundle offerings.** Another way Operators can choose to be present in the Mobile Services domain without developing their own platform is to collaborate with selected Platform Providers to bundle offerings for Operators´ subscribers. The deal between Mobile Operators and Platform Providers does not change the overall value network configuration as this approach basically consists of a commercial alliance to bundle services together. Therefore the impact is only the end-users (Mobile Services consumption value activity, see 7.2.3), who can exploit better offerings.

This strategy is exemplified by *Telia*, which has already shut down the old mobile portal and will not launch any application store; on the contrary it collaborates with external Platform Providers (*Spotify* and *Voddler*) to offer connectivity bundled with music and video services (see 5.2.1.3).

- **"Big guns": to develop a platform.** This strategy consists of developing and running a Mobile Services platform. This move has been named "Big guns" to emphasize that Operators are willing to compete with the main actors playing in the Mobile Services competitive arena as *Google, Facebook* and *Apple*. This is a high-risk strategy both because it implies investments to develop the platform and because there are several threats in the competitive arena.

  This "aggressive" approach is exemplified by *TIM* (with *TIM Store*, see 5.1.1.3) and *Telenor* (with its pilot project in Serbia, see 5.2.2.3). Both the projects follow the guidelines of the *Wholesale Application Community* (see 5.2.3).

  This strategy can be mapped by developing a scenario where the Mobile Operator take over the Platform Provider role in the value network model (Figure 105).

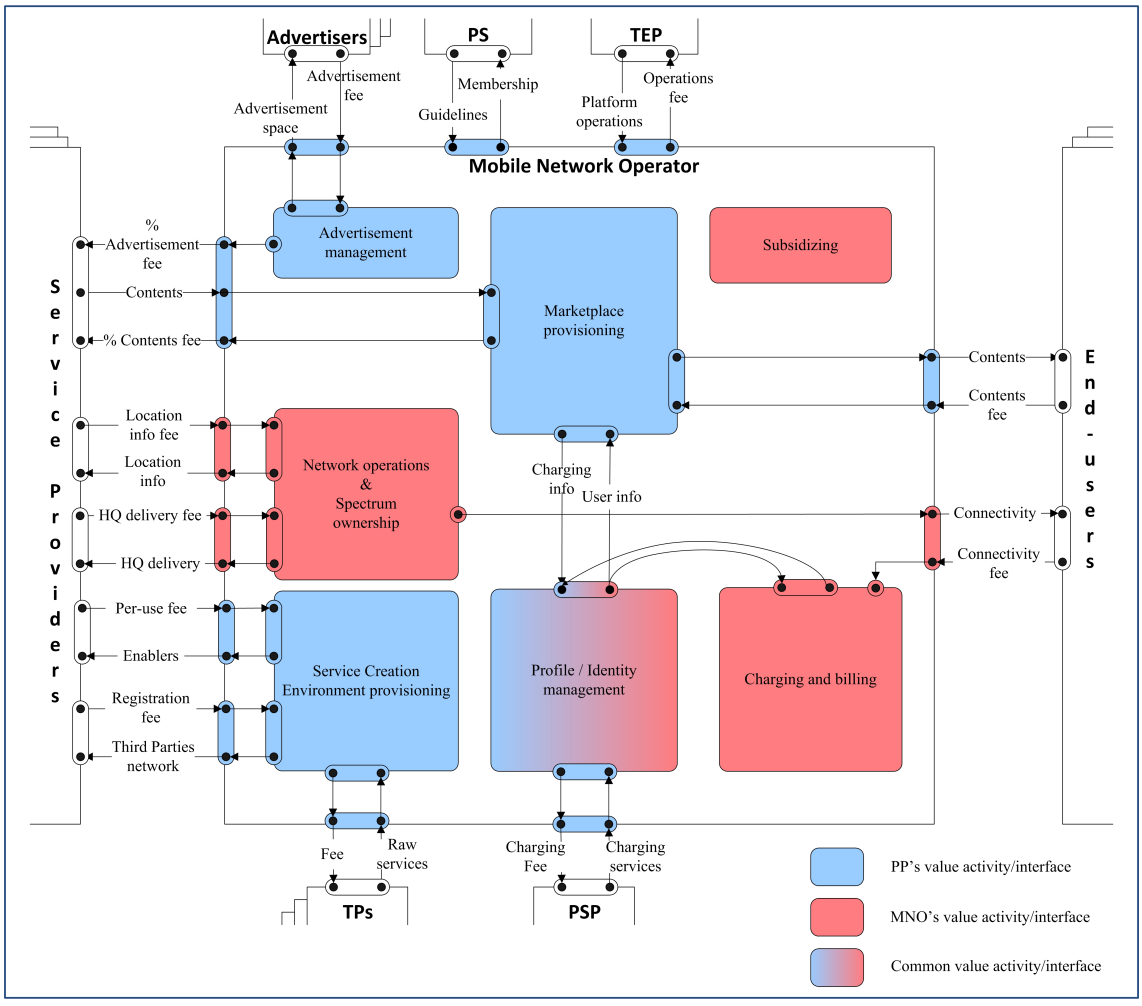

Figure 105 The MNO takes over the PP role

As a result, Operators running a Mobile Services platforms perform the following value activities: Service Creation Environment provisioning, Marketplace provisioning, Advertisement management (typical of the Platform Provider role) and Network operations & Spectrum ownership, Subsidizing, Charging and billing (typical of the Mobile Network Operator role). In addition there is the Profile / Identity management activity that is common to both the actors (see 7.2.3). As a consequences it encompasses the internal value exchange with the Marketplace provisioning value activity, the external exchange with the Payment Solution Provider (both inherited by the Platform Provider role) and the exchange with the Charging & billing activity (typical of the MNO role). This last activity handles all the payments done with the phone credit for connectivity services (as discussed for the Mobile Network Operator, see 7.2.3) and, eventually, for contents as alternative to other payment solutions provided by the Payment Solution Provider.

In this scenario the other actors exchange value with the Operator in the same way they do in the value network model (see 7.2.2): interactions with Advertisers, Platform Sponsor (PS), Technology Provider (TEP), Third Parties (TP) and the Payment Solution Provider (PSP) are inherited from the Platform Provider while the offerings towards End-users and Service Providers derive from both PP and MNO, as shown in Figure 105.

At the bottom line, these three strategies are driven by revenue sharing opportunities: that is the real trend that guides Operators´ actions in the Mobile Services domain. These actions are substantially different from each other as they involve different actors and, from the Operator´s point of view, require investments of different magnitude. Taking this into account they can be classified using the following variables (Figure 106):

- **Operator´s investment.** This dimension takes into account the internal (to the Operator) impact of the strategy. Updating the existent mobile portal is a short-term strategy representing the cheapest solution for Operators as it implies just re-organizing the contents and making them accessible to smartphones too. Cooperating with other actors (for creating a branded store within an existing platform as well as for bundling commercial offerings) has wider implications in Operators´ strategies and requires more efforts. Adopting the "Big Guns" approach goes even further: it is a challenge that massively involves the Operator to develop, run and manage the platform.
- **Impact on the value network.** "The parachute" has limited impact on the value network: while re-organizing the portal, the Operator may have to re-discuss some partnerships with Service Providers. On the contrary, adopting the "Cooperation" strategy brings new partnership in the network, both commercial (when Operators are looking for partners to bundle offerings) and technical (when Operators look for external partners to develop their branded stores). These effects are even bigger when Operators decide to develop their own Mobile Services platform as this move leads to revolutionize the value configuration.

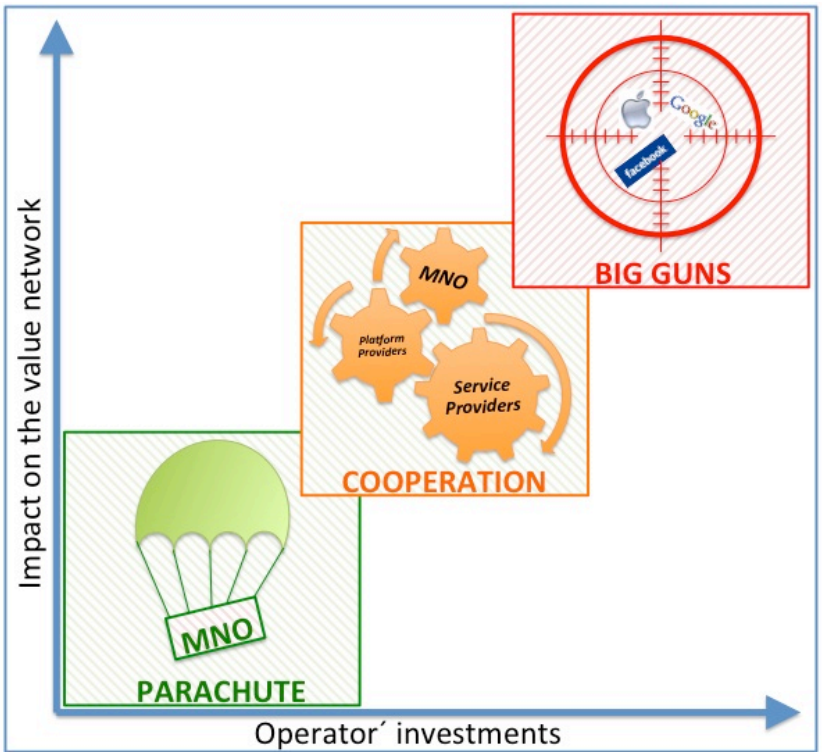

Figure 106 Platform strategies

7.5 Looking beyond the model: Operators' relationship with end-users

The previous step identifies and models Operators´ future strategies analyzing which are the effects on the mobile services value network. This part of the investigation starts from these results to go beyond: determine which are the crucial aspects the Operators have to take care not to ruin the privileged relationship with end-users.

Some of the previously described strategies aim at finding new interesting revenues opportunities in domains such as advertisement (relevant for every platform strategy) and location-based services. As highlighted before, Operators can play an effective role in this scenario as owner of the key ingredient (subscribers data) for the above mentioned business opportunities. This asset can attract advertisers interested in the mobile channel as well as be the enabler of other businesses (i.e. location-based services) run by Service Providers. Despite representing interesting revenue opportunities for Operators, these initiatives may lead to an improper usage of end-users data and thus compromise Operators' relationship with consumers, which is based on trust and loyalty. Looking at this scenario, the following questions emerge:

Can embracing location-based services and advertisement damage Operators´ relationship with end-users? How much can end-users tolerate a lack of privacy in return for lower prices?

To answer these questions, the investigation first (7.5.1) gives a general introduction that stresses how handling mobile users´ private data will be the relevant challenge in the next years; then (7.5.2) it zooms on how Mobile Operators will deal with this issue setting up a profitable business; subsequently the main expected consequences for end-users are explored (7.5.3).

7.5.1 The importance of end-users data

As widely discussed throughout this investigation, **mobile devices** have been gaining a focal position in end-users´ life. Their usage is so intense and widely spread among the population that they can be considered as "society sensors" (Rannenberg, 2011). Among the devices, smartphones and tablets are the most interesting because their diffusion has exploded during 2010 and 2011 (see 1.1.3) and because technical characteristics let them fully exploit high data-rates provided by HSPA+ and LTE technologies (see 1.2.7, 2.1.2, 2.2.6). Moreover, adopting sophisticated OS, they can be personalized to high degree.

These advanced devices will enable end-users to access more and more sophisticated and appealing **mobile services**. Within this domain, two paradigms will be extremely relevant in the next years: advertisement and location-based-services (see 4). These two elements, coupled together with mobile payment solutions (see 1.2.6), can be an explosive mixture enabling services based on context-aware advertisement, location-based billing, etc.

These trends will lead to a situation where devices will become the perfect platform to integrate different kinds of Electronic Identities (E-Identities), which helps reduce the number of cards and tokens a person usually carry, for example, ID card, door-access card/token, and bank card or other payment card. Such E-Identities may contain a person's name, photo, fingerprint, public/private keys, or

banking/payment account details (Bangdao & Roscoe, 2011). As shown in Figure 107, these data can be classified as follows (Thurm & Kane, 2010):

- **Phone number.**
- **Phone ID.** The term (Valentino-DeVries, 2010) is generically used to identify: iPhone UDID (Unique Device Identifier; it is set by *Apple* to univocally identify its devices), Android ID (it is set by *Google* to identify all the phones using *Android*), IMEI (International Mobile Equipment Identify, set by Device Manufacturers) and IMSI (International Mobile Subscriber Identity, stored in the SIM card), etc.
- **Location.** As discussed before (see 6.3), devices position can be tracked by GPS or by triangulation on Wi-Fi / cellular networks. Location info includes city, ZIP code and metropolitan area, as well as latitude and longitude.
- **Age & gender** connected to end-users´ subscription with Operators or to profiles in applications/social networks.
- **Contacts** from the address book in the phone or friend in social networks, etc.
- **Usernames and passwords** connected to accounts accessed via mobile devices.

Within this scenario (where so relevant end-users information is available) consumers´ **privacy** is a crucial concern. Privacy implies confidentiality as well as controlled disclosure of some personal information. Indeed, despite privacy is a concern of many individuals, in some cases people seem to be prepared to disclose some of their personal data for a very modest reward. An example is loyalty cards, used by superstore chains to link data of particular customers regardless of the store used for shopping.

Similar scenarios can be expected in the Mobile Services too, where the challenge of making the mobile service experience unique for users definitely goes hand in hand with a consolidating trust relationship between customers, Service Providers and/or Operators. Therefore we can state that mass adoption of innovative and sophisticated services (i.e. LBS) will depend on how well actors protect privacy of consumers.

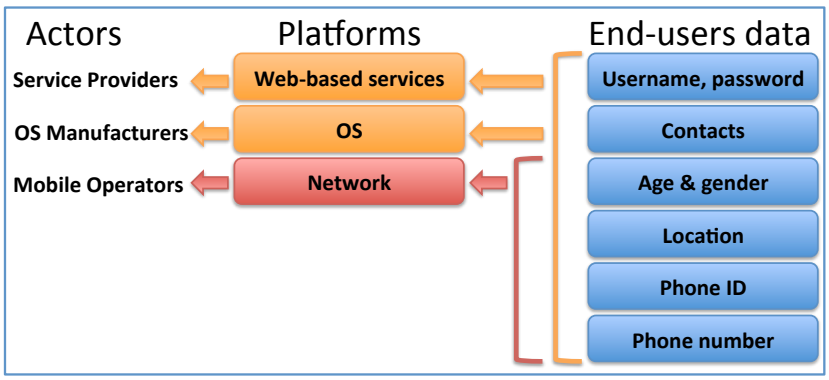

Figure 107 Actors and platforms involved in handling end-users data

Unfortunately many actors have failed (and keep on failing) to implement suitable privacy policies. Recent studies confirm how crucial this phenomenon is, showing that applications, social networks and operating systems have access to all the above-mentioned info, which are sometimes spread without authorization[127]. Following the same approach used before (see 3.2.3), this problem can be analyzed looking at different platform layers within the mobile services domain:

- **Web-based services.** The biggest areas of interest are:
    - **Social networks**. Service Providers as *Facebook* (Angwin & Fowler, 2011) and *Google*, for its social network service *Buzz* (Angwin & Efrati, 2011), have been using deceptive tactics and violated their own privacy promises to consumers.
    - **Applications**. Some Application Developers are moving in the same direction. Indeed an examination of 101 popular applications for *iOS* and *Android* showed that 56 transmitted the phone ID to other companies without users' awareness or consent. 47 apps transmitted the phone's location in some way; five sent age, gender and other personal details to outsiders (Thurm & Kane, 2010).

      Advertisement networks are central in this phenomenon as they connect advertisers with apps (see 6.3). Indeed many Developers offer apps for free, hoping to profit by selling ads inside the app. Of the 101 apps tested, the paid apps generally sent less data to other actors showing a correlation between applications price and secureness. Anyway responsibility has to be shared between Application Developers and OS manufacturers, who follow different approaches: while *Google* does not review the apps (which can be downloaded from many vendors), *Apple* does a strict review looking at function, offensiveness and other criteria. The above results show that both actors are failing to set strict privacy rules for applications published on their Application Stores.
- **OS.** *Apple* is the center of a huge debate as two researchers have recently uncovered a secret file on *iOS* that keeps a record of where the phone has been and when it was there. Even if there is no evidence that the file is transferred to *Apple*, the company has previously said it uses location data to serve ads and provide location-based services. No similar database is stored on *Android*, even if *Google* has previously said it collects location for things like advertising and to provide traffic statistics on *Google Maps*. (Valentino-DeVries, 2011; Helft & O'Brien, 2011)

To sum up, there is a complex ecosystem of actors and platforms dealing with end-users´ private data that may be forwarded to interested parties without authorization. Moreover it is curious to note that all the three "giants" (*Apple*, *Facebook* and *Google*) that have been taken as point of reference throughout the investigation are involved in privacy issues. This is a further confirmation that the phenomenon is relevant and will be more and more in the future.

[127] This situation may be the result of hostile initiatives by hackers; anyway this scenario is not encompassed as the focus is on actors´ strategies.

7.5.2 Operators' strategies and end-users data

After analyzing how important end-users data are in the mobile services domain and which are the actors involved in handling this information, the focus is restricted on Mobile Operators. As shown in Figure 107, **Mobile Operators** handle important end-users data too; as discussed before (see 1.3), they have been collecting data as phone number, phone ID, location, age & gender, which are important for activities as call routing, billing, etc. They hold this information in their central systems and not in the OS (OS manufacturers) and services (Service Providers) running on the devices. Nevertheless users data flows on networks owned by different Operators (i.e. for roaming); therefore each Mobile Operator has to trust its own network infrastructure but also other Operators´ infrastructure. If this ecosystem works properly, the risk of unwanted utilization of end-users data is reduced.

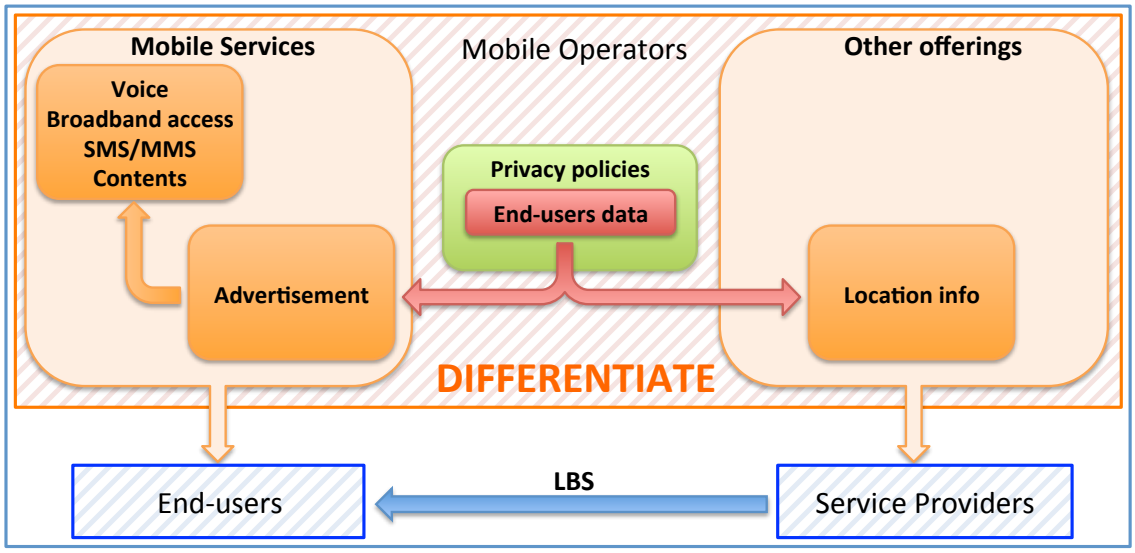

Figure 108 End-users data at the core of Operators´ strategies

Setting aside these aspects, it is interesting to focus on Operators´ strategies to deal with end-users data. To keep this dissertation as open as possible to future developments, the starting point in the generic **"differentiate" strategy** sketched before (see 1.3), here re-interpreted and projected to the future (Figure 108).

Due to revenues drop in the consumers market, Operators need to find new ways of remuneration. To achieve this goal they will very likely shape their future business models around end-users data. As previously remarked, these data have to be properly protected by adopting severe **privacy policies** (Figure 108): this is the *sine qua non* condition for strategies that aim to be successful in the long-term.

As widely described before (see 7.5.1), **Information about users location** represents the most interesting data for Operators´ future business models. They are the only actors in the value network able to provide these data, which are the key ingredient to allow Service Providers to develop location-based services for end-users (see Figure 108). Thus Operators do not offer LBS to end-users but some sort of crucial enabler to Service Providers. This offering can guarantee additional revenues to Operators but information has to be handled carefully because is

sensitive and protected by several privacy regulations[128] that Operators have to transpose into proper internal policies. For example, if the data cannot be handled fully anonymously, the user's consent has to be given and processed in a comprehensible fashion.

Location is not the only interesting information. Indeed data about subscribers´ phone number, age & gender, etc. are very valuable too as key ingredient for advanced advertising services. **Mobile advertisement** has already been analyzed during this investigation as general trend in the mobile services domain (see 6.3) and, more in detail, as business opportunity for Platform Providers and Advertisers (see 7.2.2). Here the goal is to understand how advertisement can be an interesting source of revenues for Operators: thanks to the vast amount of information about the subscribers, they can attract Advertisers who want to launch campaigns on the mobile channel offering them information about appealing market segments to target.

It is important to point out that Operators have been exploring advertisement for a long time but emerging paradigms (such as the Application Stores) may lead to new and more pervasive strategies that are interesting to be sketched and discussed. For example, Operators can couple advertisement with their mobile services as voice (introduce small spots before phone calls in return for lower price plans as done by some VoIP Operators as *Jajah*), contents (adopt approaches similar to the ones described for Platform Providers with Advertisers, regardless which kind of platform strategy they will choose) SMS/MMS (incorporate ads in messages), etc. in return for lower fares for end-users.

Overall, this business model replicates *Google´*s approach, which has advertisement has its backbone (search advertising, display advertising, context aware advertising, etc.); as a consequence most of the services are offered for free to consumers. Anyway Operators´ history and development are completely different compared with *Google*, which has evolved looking for advertisement possibilities in different areas (search engines, mobile devices, etc.). Indeed Operators´ possibility to offer information about users location and to incorporate ads in mobile services has to be seen as an attempt to compensate the drop in consumers´ expenditures for mobile services (see 1.3).

It is impossible to forecast how effective this try will be. What is sure is that it will lead to a progressive re-configuration of Operators´ revenues streams: similarly to what described for Platform Providers (Figure 90, see 7.2.2.3), revenues from the retail market (mobile services) will decrease while other components (as revenues from advertisement and from the wholesale market[129]) will grow. As final result, Operators´ revenues will be more balanced among the different components. The main positive effect of this trend is that Operators will be able to spread the risk related to network infrastructure investments on even more business areas lowering their dependence from the consumers market.

[128] Directive 95/46/EC and 02/58/EC.
[129] This area will be pushed by the explosion of MVNO (see 1.2.2).

Nevertheless this approach has some possible drawbacks too:

- **Speed up of mobile services revenues decline.** Introducing advertisement may allow Operators to offer cheaper price plans for voice, broadband and SMS/MMS services as well as to deliver most of the contents for free. Despite these moves are aligned with the general trend showing a contraction in users´ willingness to pay for mobile services (see 6.4), they may lead to a fierce price competition on the retail market. Indeed opening up their services to more and more advertisers, Operators would be able to be more and more aggressive in their price strategies towards consumers. The worst scenario may be a price war with prices (ideally) tending to zero.
- **Bad appeal on end-users**. There is a fine line between benefits introduced by personalized services (i.e. context aware advertisement) and privacy concerns. If the latter aspect prevails the former in users´ perception, Operators´ business model may have a bad appeal on end-users, as discussed in the next section (see 7.5.3).

7.5.3 Consequences for end-users

Operators´ initiatives will affect, in one way or in another, customers´ **perceived value**[130] of mobile services and, consequently, Operators´ relationship with end-users. This privileged relationship is based on consumers´ **trust**: the main foundation to achieve costumer loyalty. Thus trust has an immense value for Operators and will play a crucial role in future strategies because, despite the unique benefits of innovative and sophisticated mobile services, overcoming trust issues is a major obstacle in their adoption. For example, many consumers feel uncomfortable with the idea of conducting commerce and sharing personal information on their devices because they do not trust the Providers. Moreover trust strongly increases behavioral intention to accept SMS advertising both directly and indirectly through increasing perceived usefulness of the service.

Summing up, customers´ perceived value of mobile services has a crucial role in building and maintain trust and vice versa. Embracing location-based services and advertisement can influence customers´ perception in a positive way due to:

- **Personalization.** Identifying end-users´ location and properly handling additional information about subscribers will allow Operators and Service Providers to deliver services tailored on users´ profile and context improving customers´ perceived quality.
- **Cheaper price plans.** As discussed before (see 7.2.2.2), revenues from advertisement may push Operators to lower price plans for voice/broadband and SMS/MMS services as well as prices for contents. Even if this aspect does not have direct implications on services intrinsic attributes (as does not improve the services themselves) the effect is indirect: a subscriber can access to the same services at a lower price.

[130] Value reflects the sum of the perceived tangible and intangible benefits and costs to customers. It can be seen as primarily a combination of quality, service and price (QSP), called customer value triad (Kotler & Keller, 2009).

There are some other aspects that may lower customers´ quality perception:

- **Poor user experience.** Introducing advertisement in mobile services (as exemplified before) may lower customers´ perceived quality of the services as end-users may be bombed by ads in contents, SMS, etc.
- **Privacy issues.** As highlighted before (see 7.5.1), initiatives as unsolicited mobile advertising or tracking services may be considered intrusive and therefore they may lower costumers´ perceived value of mobile services.

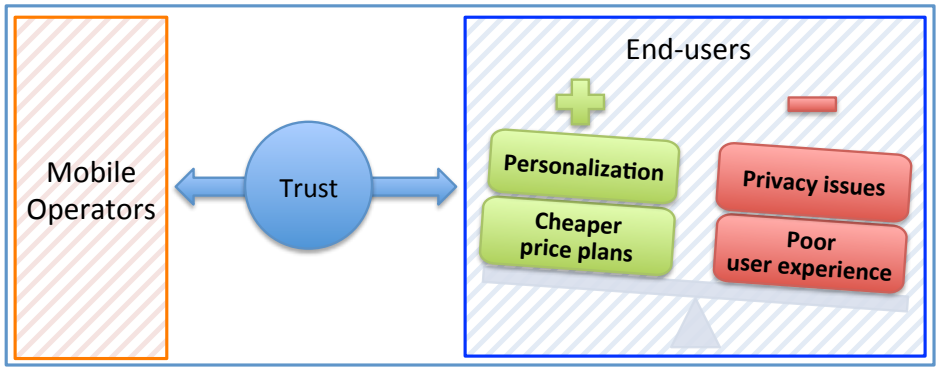

Figure 109 How Operators have to deal with end-users´ concerns

Customers will evaluate positive and negative aspects (as shown in Figure 109): if potentials enabled by more personalized services and the opportunity of having cheaper price plans will overcome privacy problems and poor user experience, consumers will respond positively to Operators´ strategy.

On the contrary, if the negative aspects will prevail (mobile services will have lower value for consumers) the **threat of substitute services** (voice and data services cannibalization, see 6.4) may become even more real. Most of the Operators we have interviewed do not see VoIP and social networks as actual threat for voice and messaging service claiming that quality is too low. Anyway, introducing this new perspective we can expect this gap will be substantially reduced. If this expected scenario will materialize, Operators will be trapped in their own strategy.

Taking into consideration all these aspects, Operators´ goal is to protect their privileged relationship with consumers by developing offerings that do not lower customers´ perceived value while encompassing advertisement and Location-based services. This guideline seems straightforward but it is far from easy to implement as not all the consumers have the same value perception.

The optimal way to deal with this topic would be to segment the market as accurately as possible and tailor general strategies for each segment, identifying which segments will better accept services with advertisement and which will more likely use LBS. Many authors (Rozen, Anulewicz, & Senn, 2010; Crook, 2009; Sell, Walden, & Carlsson, 2010) identify a vast number of market segments[131] in the mobile services domain that would help to accomplish this task. Nevertheless adopting a too complicated method would divert the investigation on a secondary path. Willing to focus just on the most important causes influencing consumers

[131] For the definition see 7.1.

value perception, the chosen approach is to conduct a simpler analysis looking at two crucial dimensions:

- **Price.** Together with services main features, price is the main variable used by consumers to estimate value. There are consumers who are more cost-focused (looking for low-cost price plans, free contents, etc.) and others who are willing to pay premium prices for services (heavy-users who prefer flat price plans, etc.).
- **Usage.** This dimensions describes consumers´ behavior[132] with mobile services: on one side there are traditional subscribers (they use "normal" mobile phones, their attention is mostly drawn by voice and messaging services, etc.); on the other there are "Smart" subscribers (they use smartphones or tablets, are familiar with mobile broadband and application stores, they will more likely be among early adopters of 4G services, etc.).

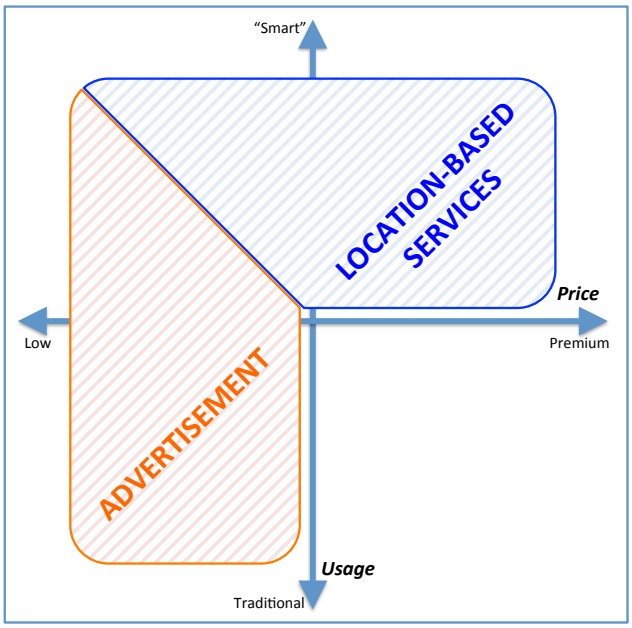

Figure 110 How consumers perceive the value of mobile services

Coupling together these two dimensions we obtain four different segments (Figure 110). This differentiation allows refining the above considerations as follows:

- **Advertisement is suitable for cost-focused consumers.** Mobile services including advertisement will be more accepted by consumers who are attracted by low price plans. Being highly sensible to prices variation, they will more likely disclose some personal information in return for lower fares. On the contrary, consumers with higher willingness to pay for mobile services (premium costumers) have higher requirements in terms of services performances and availability and lower sensibility to prices variation.
- **Location-based services will be adopted by "smart" users**. Being among the most sophisticated services, location-based services are likely to be adopted just by users who heavily utilize smartphones and tablets for a

[132] It can be considered as a rough form of behavioral segmentation (Kotler & Keller, 2009).

wide range of services. As discussed before, Operators does not directly offer LBS because Service Providers do. Nevertheless, in order to protect customers´ privacy and maintain their trust, Operators should choose very carefully to whom release information about users location, looking at which offerings Service Providers will develop and at which are the targeted segments.

Taking into account these considerations, Operators should look at their position in the mobile services consumers market. More precisely, two are the crucial aspects:

- **Value proposition** [133]**.** If the Operators´ value proposition encompasses a wide range of services (voice, messaging and data services together with additional offerings as contents on application stores, access to TV, etc.) to extensively cover customers´ needs, location-based services will find a fertile ground to be adopted. On the contrary, if Operators´ offerings are narrower (just voice, data and messaging) it is very difficult that these services will be massively adopted.
- **Target market** [134]**.** If most of the targeted customers are attracted by low cost services (i.e. the *Tele2´s Comviq* brand in Sweden), introducing advertisement is feasible and effective. On the contrary, if the Operator deals with premium customers (i.e. *Telia* in Sweden) this move would be an enormous mistake.

[133] A statement that summarizes why a consumer should buy a product or use a service (Kotler & Keller, 2009).
[134] Group of customers that the Operator has decided to aim its marketing efforts (Kotler & Keller, 2009).

8 Conclusions

The following questions have guided the whole investigation:

In the Open Mobile era, how can Mobile Operators defend their position in the value network? How can platforms play a strategic role to achieve this objective?

Now these questions can finally be answered in a proper way, looking at the main findings of the research (8.1) and considering ideas about further studies (8.2).

8.1 Main findings

The main contribution of this investigation is to identify possible strategies that give Operators the opportunity to keep on playing a meaningful role in the Mobile Services domain. This is done in a systematic way, developing an innovative value network model that allows mapping these strategies and their implications. From this analysis it emerges that two are the main driver behind the strategies:

- **Defeating network congestion:** investing in network upgrade, optimization & spectrum auctions, charging Service Providers for HQ delivery services and elaborating data price plans for mobile customers.
- **Finding new revenue opportunities**: working with Service Providers to offer Location-based services, offering charging services to interested parties and working on Mobile Services platforms (updating the old mobile portals, creating branded stores within existing platforms, collaborate with Platform Providers to bundle offerings and develop platforms).

These strategies are not just theoretical but they are related to what the Operators analyzed in the case studies are actually doing or have plans to do.

In the next years, Operators will have to fight for every inch of ground with giants as *Apple*, *Google* and *Facebook*. Moreover revenue sharing contracts will become the dominant paradigm regulating relations among actors.

The model itself has an important impact on the current academic knowledge about the Mobile Services domain because it is complete, platform-oriented and innovative, highlighting unique characteristics compared with other value network models.

Besides this fundamental aspect, this research provides some other minor contributions. First it introduces a schematic approach to analyze the industry distinguishing between structural configuration (actors, technologies, services, devices, end-users) and trends. In addition, this study gives an important methodic approach to classify scientific articles about Mobile Services platform proposing to dimensions of analysis: complexity of platform definition and number of actors involved in the value network.

To conclude, this dissertation gives some good hints to reflect about the delicate topic of shaping strategies after a massive usage of end-users data to provide innovative and sophisticated mobile services. Indeed behind interesting revenue opportunities, there might hide the serious risk of betraying customers´ trust, giving birth to a price competition on the mobile services consumers market and

making higher the risk that VoIP and social networks will overcome traditional voice and messaging services.

8.2 Further studies

Two are the most important areas for future studies:

- **Improve the value network model.** Mobile Services value networks evolve very quickly so it would be interesting to follow this evolution updating the model developed in Chapter 5. Besides this aspect, the model can be made even more sophisticated by adding other actors, mapping value activities more in detail, etc.

  It is important to state that this path may lead to a too complex model, making it more difficult to interpret and use. Finding the right compromise between complexity and usability has to be the first concern while choosing to evolve the model here presented.

- **Further investigate end-users behavior**. The whole investigation adopts an operator-centric perspective, looking at Mobile Operators' strategic challenges for the future. In Chapter 6, this perspective changes because the focus is more on end-users possible reactions to these strategies. Nevertheless this is just an attempt to explore the topic rather than an exhaustive dissertation about it. Therefore, adopting a customer-centric perspective, it would be extremely interesting to further analyze possible customers' response to operators' strategies in terms of services adoption, perceived value, etc.

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