Mobile Networks as a Two-Sided Platform - Case Open Telco

Yrjo Raivio[1] and Sakari Luukkainen[2]

Aalto University, School of Science, Department of Computer Science and Engineering,
[1] yrjo.raivio@aalto.fi, [2] sakari.luukkainen@aalto.fi

Abstract

Internet companies have utilized the benefits of open innovation and open APIs for a long time, but mobile operators are just entering the open domain with a concept referred to here as Open Telco. This paper investigates how open APIs can be applied to mobile networks in order to transform them from a one-sided into a two-sided platform where new business models can be utilized. The research method is based on a single case study using a representative usage scenario. The research framework, applied in this case study, was driven by the literature analysis. The research was started by creating a set of usage scenarios for analysis by an expert group. The most representative case was then selected for a closer examination with the results presented in accordance with the research framework. According to the results, the Open Telco concept creates an ecosystem that enables a two-sided platform. However, positive network effects require at least national coverage; developers want innovative pricing schema and novel payment services need changes for regulation. Finally, the research limitations are expressed, the proposals for the next steps are given, results are compared with the literature findings, and conclusions are drawn.

1   Introduction

Openness has not been the underlying driving force in the mobile domain. Instead, mobile services have been technology and standardization driven as well as, strictly controlled by operators, who have decided the terms on which developers have been able to create novel services. This approach has been called a closed or walled garden model. For end users the closed model offers both positive and negative impacts. The end user experience is consistent, although, the service selection can be limited. Access to external service portals can be allowed, but price discrimination often violates the principle of network neutrality. Until today, the closed model has been very successful, but the weak signals indicate things can be about to change. In 2010 for the first time in Finland, the number of sent text messages did not grow anymore (Site 1), while the average revenue per user (ARPU) of TeliaSonera has been in decline for most of the decade (Site 2). In addition, a high customer churn rate continues to be a major challenge to operators. On the plus side, the exponential increase of mobile data usage [9] has been positive, although, unfortunately, the data income has grown only linearly [2].

The ARPU measure has some limitations, however, because it does not take into account multi-subscription-users. The average profit per user (APU) would be a better standard point of comparison [35], but those figures are not publicly available. Nevertheless, Figure 1 summarizes the key problems in the mobile domain. New revenues from data services do not yet fully compensate for the losses caused by the decreased number of voice minutes. Furthermore, subscribers easily change their operator, because all operators offer the same basic services, and there is no operator ecosystem that would serve to attach customers to any specific operator. Simultaneously, regulation has systemically lowered the barrier for the operator swap. Figure 1 clearly reveals the moment in 2004 when the number portability feature was introduced in Finland. A high churn has a direct negative impact on the ARPU value. The churn has also increased during the last few years, but the exact reason is unknown. One factor may be found in new legislation, defined in 2006, that allowed the subsidization of 3G phone purchases. In 2011 more churn is expected, because a new law will allow customers to change their operator, even in the middle of the agreement period.
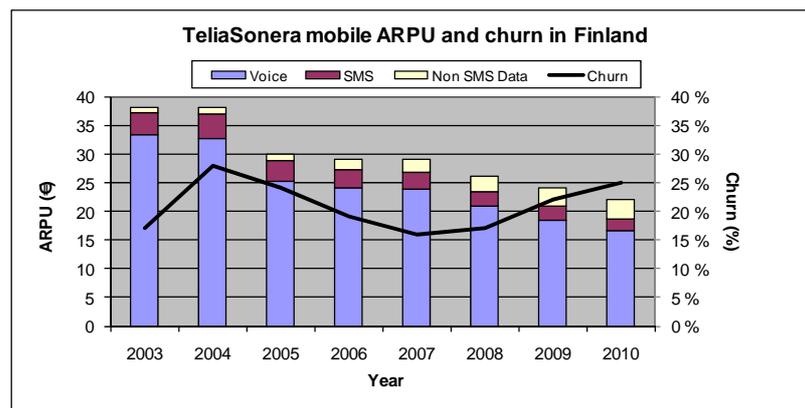

Figure 1: TeliaSonera mobile ARPU and churn in Finland

Instead of the closed models, operators may find new opportunities in more open strategies. At the other extreme, operators can partly or fully omit the service domain. This strategy is called an open or a bit pipe model. In this approach end users have full access to any service provider content, while operators just provide a transport connection that is usually charged on a flat rate basis. The open model does not provide a good incentive for the operators because they do not have a controlling position in the value network, and also because revenue growth can be difficult to achieve. A more viable option can be a hybrid strategy, also called open gardens [20]. In this approach an operator balances its actions between the closed and open models to utilize existing strengths. One of the strengths is a phenomenon called an Open Telco [36]. The Open Telco promotes the idea of applying open innovation to the operator ecosystem. The main logic here is to harness the innovativeness of open communities in order to develop novel end user services using open network interfaces. Internet companies have already effectively applied open APIs to create new ecosystems around their products, and mobile operators are encouraged to follow this approach. Network APIs provide a device-independent and coherent solution for developers, by enabling novel business models, including both application stores and two-sided business models [29].

The current operator business models are often straightforward. Operators collect revenues from subscribers, and further pay content providers and other developers their share of the income. This one-sided mobile platform approach is transforming into a two- or even n-sided platform. Not only end users, but also developers, content providers, advertisers, brokers, aggregators and even other operators may bring in new incomes for the API providers. Already a one-sided mobile network platform has proven the power of the network effect in the popularity of text messaging, but many-sided platforms enable even more versatile business innovations through cross network

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effects. Still the main revenue source will be a subscriber, but complex value networks between subscribers, operators and content providers bring totally novel business opportunities. The appropriate markets can be classified as two-sided, double two-sided, three-sided or hybrid markets [19]. Nevertheless, operators must provide added value for the ecosystem or otherwise the operator will be bypassed. One solution is to go for the broker business. In the mobile industry the idea of a service broker has been recently presented in various papers [3], [26]. A broker concept can be applied to the Open Telco concept, too [37].

This paper investigates how the Open Telco system will enable two-sided mobile platforms. The scope for this is in mobile ecosystems that are based on network APIs. Device based ecosystems, such as Apple's App Store, Google's Android Market or Nokia's OVI, are excluded from the study. Those ecosystems are tied to mobile operating systems, while the network based approach provides a device independent alternative. Similarly, operators' Rich Communication Suite (RCS) initiative is excluded, because it requires an RCS enabled smart phone and a network support by IP Multimedia Subsystem (IMS). The research method is based on a single case study, utilizing a representative usage scenario selected by an expert group. The scenario was also implemented and the quasi experimental system was analyzed within a research framework deduced from the literature analysis. The paper is organized the following way. Firstly, the literature review is presented concentrating on two-sided platform theory, network effect impact, development of mobile service ecosystems, open innovation and regulation. Secondly, the research methodology is described, followed by a presentation of the research results shown in accordance with the research framework. Finally, the limitations of the research are evaluated, future research topics are proposed and conclusions are drawn.

2   Literature Review

This chapter summarizes the major literature findings from topics relevant to the paper. The literature review was applied to deduce the chosen research framework used in the study.

2.1   Two-sided Platform

Ballon defines the two-sided platform theory as describing cases where two different types of customers interact on a platform. The interaction is affected by indirect network externalities located on the opposite sides of the platform [4]. According to Evans and Schmalensee [14], many diverse industries, including telecom networks [4], are occupied by businesses that operate two-sided platforms. The customers of these businesses have a relationship between each other, and for that reason, a common meeting place is required. Two-sided platforms are common in old, advertising based economies, and they play an important role in minimizing the transaction costs between the customers. Regardless of the industry type, the two-sided platforms must meet a few common requirements. Rochet and Tirole [39] list the following critical factors for the pricing of two-sided platforms: governance e.g. for-profit vs. not-for-profit, end users' cost of multihoming, platform differentiation, platforms' ability to use volume-based pricing, the presence of same-side externalities, and platform compatibility. Evans and Schmalensee [14] define similar topics: indirect network effects, scale economies, congestion, platform differentiation and multihoming.

Eisenmann et al. warn [13] about three other critical factors relating to two-sided platforms: correct pricing and two threats, winner-take-all and envelopment. Pricing is complicated in two-sided markets, due to the subsidization of some user groups [33]. Rochet and Tirole [39] found that both on monopoly and competitive platforms the price structure is defined to attract both sides on board. In addition, multihoming will make the prices more favorable to sellers than buyers. The winner-take-all –threat means that the platform provider may have a temptation to exclude other players from the market which is harmful for the end users. The envelopment threat refers to a case where we have several platform providers and common customers. In this situation one provider may try to exclude other platforms from the market. The two-sided Open Telco platform can be either the for profit or not-for-profit type. In this research the main assumption has been that the platform revenues will cover costs, but not bring any substantial profits for the owners. In addition, the platform would be based on proprietary, instead of open source based, components for efficient operability [11]. Finally, the two-sided platform theory involves challenges, too. Evans and Schmalensee [14] note that the theory is based on abstract models, lacks empirical data, and thirdly, depends very much on the industry area.

2.2   Network Effect

Telecommunication networks represent typically a one-sided platform, where the direct network effect mechanisms apply, but things change on two-sided platforms. Rochet and Tirole [39] define that a two-sided market with network externalities exists if a platform can cross-subsidize between different categories of end users that are parties to a transaction. Parker and Van Alstyne [33] say that indirect effects are consumption externalities upon purchasing compatible products. Varian and Shapiro [40] call network effect a demand-side economies of scale. It means that a demand of a service or good defines its value. This case can be called also the direct network effect, but the indirect network effect brings often a chicken-and-egg problem. The key distinction for two-sidedness is that network effects must cross market populations. Tuunainen and Tuunanen [44] discuss especially the n-sided network effects. They summarize that the platform's value to users largely depends on the number of users on the other side of the

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network, and the value of the platform relatively grows when both sides are matched. They argue that it is crucial to understand both same- and cross-side network effects, as well as different types of costs related to the platform for users on both sides. On the same-side a positive network effect can be obtained by economics of scale, while a cross-side phenomenon brings indirect network effects. For example, a freemium business model utilizes both network effects. On the same-side the losses caused by the free users are also compensated for by the premium users. In addition, due to the cross-side network effects, free users attract a critical mass for the content providers making it possible to create chargeable services for the premium users [33].

2.3   Mobile Ecosystem

Mobile networks form highly complex business ecosystems in which numerous segments, both incumbent and emerging, are connected to customers. Relationships between the ecosystem partners are critical, and mobile business models must adapt to a network centric approach [5]. Mobile services incorporate a vast number of risks, such as the correct business and investment strategy, limitations in mobile devices, constraints in networks and infrastructure, security concerns, and user distrust [41]. Furthermore, 3G operators have seven challenges: license cost, infrastructure and network cost, profit distribution, number portability, MVNO, decreasing voice ARPU, and other operators [24]. New telecom services put pressure on value chains, corporate resources and skills, economics and patterns of regulation [28]. Additionally business instability, investment requirements, changing economies of scale, and the migration of mass media into telecommunication networks challenge the current regulation pattern [30]. However, it seems that regulation does not have a major impact on the dynamics of business models, although the telecom side might be an exception. Instead, technology and market forces play a major role [38]. Current changes in the telecommunication industry can be very radical, and it is for that reason that the current strategies are challenged. This development will accelerate the movement from value chains into a value network with multiple entry and exit points. As a result, the complexity of the system will generally expand [25].

Value is created through the exchange of goods, services and revenue (GSR), knowledge and other intangible benefits [1]. The value chain analysis is the traditional method of evaluating the value created by products and services. A network perspective, on the other hand, provides an alternative perspective that is more suited to new economy organizations, particularly for those where both the product and supply and demand chain is digitized [35]. The value chain analysis also fails to describe the dependencies between the resources of different companies. Value networks solve this problem, however, because the value network illustrates the interactions between companies. The customer is the key element in the value network, and enterprises tailor their services around it. Companies become members of the value network, based on their unique competencies. Nor is the value network tied to any specific region, but can be global in nature. Additionally, the same value network can include companies from different industries [34]. Critical design issues in business models for mobile services can be evaluated using a STOF (Service, Technology, Organization, and Finance) model [18]. The associated causal framework can be used to review the network value created by different components of a mobile service.

2.4   Open Innovation

In the case of incremental service evolution it is possible to assess the market and make financial analyses before the beginning of the development, whereas in the case of radical service innovation the market analysis contains considerable uncertainty. The problem is often that in such a situation more attention is focused on the differential technological advantage that the new service will offer over the existing solutions rather than on customer benefits and commercial opportunities [45]. Successful new service innovations are influenced by the renewal of the technology infrastructure. The usage of modular system architecture in the introductory phase of a new communications platform, when the market uncertainty is high, provides a larger field of options from which to select according to subsequent market development and emerging customer needs [15].

Modular system architecture, such as the one used in the Open Telco platform, enables experimentation in novel services, especially when they are targeted at latent end user needs. The latent needs of the end users tend to develop from more basic features into more advanced ones during such an experimentation process [10], [27], [43]. New services should be developed by a process of phased approximations and finally to approach the market on the basis of better information in circumstances of lower uncertainty. Identifying critical success factors in an early phase makes it easier and cheaper to react to any problems and to approach the right market segments by employing the right timing, differentiation and pricing. Open innovation [8] can be applied to the mobile industry as well, because network operators do not have the breadth of knowledge to innovate in various customer segments [15]. Additionally, in the long term, closed networks have a tendency to lose innovativeness [17]. If the optimum of internal and external ideas can be found, a win-win situation can be established. On the other hand, an open approach requires more careful strategy than a controlled one [40]. In certain cases new innovations may cannibalize the existing services, such as mobile voice and text messaging services [16].

2.5   Regulation

The telecommunications industry has always been strictly regulated. Depending on the technology and market phases, regulatory requirements have constantly changed, and followed specific needs. Commonly regulation has

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stressed factors such as universal service, common carriage, cross-subsidies, structural restrictions, industrial policy, and price control. In future this approach is perhaps not enough because social networks and mass media and entertainment industries are increasingly using operator networks for content delivery, a fact which increases pressure on telecommunications policies. Moreover, the whole industry is in an unstable state, where investments are high and economies of scale change [31]. Network neutrality is a debatable requirement in a mobile environment [23]. On the Internet, the transparency of applications has been a virtue, and the same approach has been demanded for mobile networks, too. However, operators have been reluctant to accept this due to the different nature of the mobile network. In the mobile network the last mile is expensive and also a bottleneck. If traffic is not controlled, free riders will exhaust scarce radio resources. A functional separation of network and application layers might be one solution to the problem [7], [21]. Open APIs are fully transparent to any user, enabling equal access to operators' network layer assets.

3   Research Methodology

The research was done using the single case study methodology that has been defined by Yin [46]. A single case study is also known as an intrinsic case study [42], which analyses one case in depth. Such a single case study, using a holistic, eq. single-unit of analysis, design and an exploratory approach, is well suited to examine service innovations that represent a new phenomenon. These sorts of cases are typically under development, and on the other hand, are beyond control. By using the case study method, it is possible to observe the phenomena specific to the industry in greater detail. The single case method is based on a representative case analysis, where one specific case clearly covers a number of other cases. The specific case in question was the final output of an expert analysis where the STOF model was utilized to review the usage scenarios.

The research case study method followed the general case study structure that is described by Yin [46]. First, a literature review was carried through on the theory on two-sided platforms, network effect, mobile ecosystems, open innovation and regulation. According to Eisenhardt [12], without a research focus, it is easy to become overwhelmed by the volume of data. As a consequence, the research scope adopted was limited to an own synthesis of the existing literature. The methodological instructions of Yin [46] and Eisenhardt [12] suggest that a framework containing specific dimensions has to be created that also improves the ability to compare results with the existing literature. The representative case was also implemented to create a quasi-experimental system to enable repeatable tests and further conclusions.

The research framework, applied to the single case study, was deduced from the literature review. The core framework was based on papers by Evans and Schmalensee [14], Rochet and Tirole [39], and Tuunainen and Tuunanen [44] forming the following dimensions: network effect, economies of scale, scalability, differentiation and multihoming. Additionally, based on input from Eisenmann et al. [13] and Tuunainen and Tuunanen [44], pricing, was added to the framework. Eisenmann et al. also warned about envelopment and dominant design threats, but those topics require a mature market with several parallel service providers. Finally, open innovation and regulation completed the framework, because openness and continuous experimentations are the key enablers of the Open Telco concept, and the impact of regulation cannot be neglected in the telecom sector. Figure 2 illustrates the relationships of the research framework in a two-sided platform, and Table 1 defines the main references and explanations of each dimension. Finally, Figure 3 concludes the complete case study method.
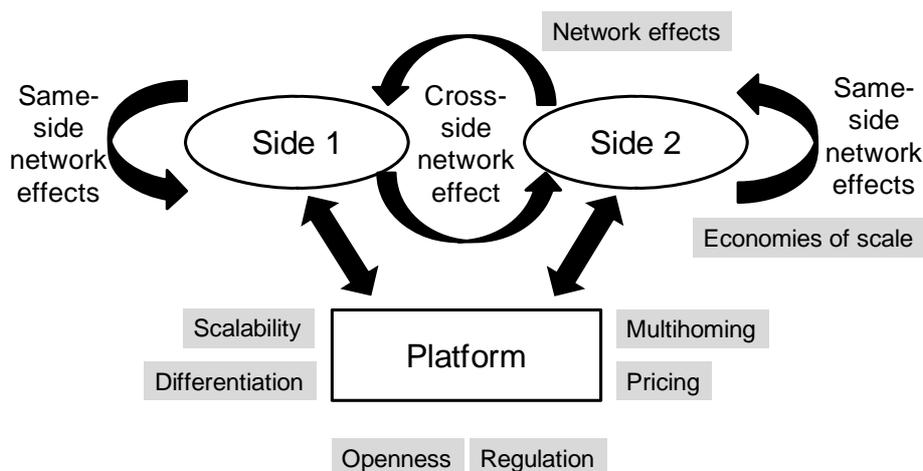

Figure 2: Research framework on two-sided platform (adapted from [44] p. 5)

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Table 1: Research framework

| No	Dimension	Ref.	Meaning
1	Network effects	[14],[39],[44]	What are the same- and cross-side network effects
2	Economies of scale	[14],[39]	Can the platform cope with the capital and operability expenditures
3	Scalability	[14],[39]	Can the platform scale up and down
4	Differentiation	[14],[39]	How the platform can be tailored to specific needs
5	Multihoming	[14],[39]	How the parallel platforms impact the market
6	Pricing	[13],[14],[33]	What is the correct pricing
7	Openness	[8],[10],[15],[40],[43],[45]	Impact of open innovation
8	Regulation	[21],[31]	Impact of regulation
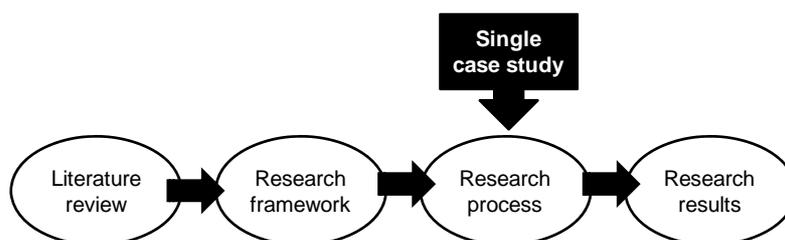
Figure 3: Case study method

4   Case Analysis

The single case analysis is depicted in this chapter, starting with a description of the research process, leading to the scenario selection and, finally, describing the results according to the research framework.

4.1   Research Process

The research process that is part of the case study method shown in Figure 3, illustrates a practical approach to reviewing the steps between the open API and new business. The research process started with a description of APIs. Both the technology and business features of the APIs were defined. In the second phase, a set of usage scenarios, utilizing the previously defined APIs, was described. In the next step a group of experts analyzed scenarios, and the best cases were selected for closer business examination. The most promising business cases were further analyzed using the STOF method [22], and the best case was transferred to the implementation phase, called the Factory. As a result, a quasi-experimental prototype was created. Due to lack of time the system had defects, and for that reason it was returned to incremental updates. When the accepted prototype is finally available, it will be tested among end users for feedback on user experience. If the results are positive, new business spinoffs can be expected. Figure 4 defines the Open Telco research process.
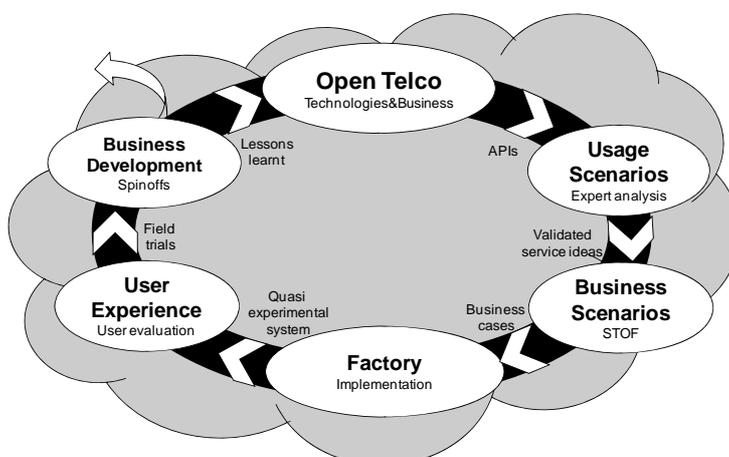

Figure 4: Open Telco research process

4.2 Scenario Brainstorm

The travelling industry offers a lot of opportunities for the usage of open APIs. Buying tickets, finding routes and places are typical challenges where mobile phones can provide necessary help. On the other hand, the most difficult travel problems usually occur abroad, which means that open APIs must be supported over national borders and operator networks. Social networks connect people together, and mobiles with social networks such as Facebook, are in a strategic position to enable the services. A more novel idea is to open the communication history to the developers. Tim O'Reilly [32] proposed the idea already in 2007, but since then there has not been too much progress. Another attractive alternative for mobile operators concerns money transfers. Operators have very reliable and fine-tuned machinery for billing, but it is only used for internal charging purposes. The same billing equipment could be applied to external services, too, but often national regulation prevents the idea. Reversed charging solves one critical problem in the current networks. In most countries the main charging principle is based on the initiator of the call or message paying the communication charge. This in a logical rule in person-to-person communication, but in one-to-many types of community services this logic can create problems. The last two usage scenarios, machine-to-machine (M2M) and Internet Protocol television (IPTV) were also added to the list to obtain non-mobile examples. Table 2 summarizes the usage scenarios and related open APIs.

Table 2: Open Telco usage scenarios

No	Usage scenario	Open APIs
1	Travel guide	identity, location, messaging, payment, profile
2	Social search	identity, location, messaging, presence, profile
3	Communication history	call, browsing, identity, location, messaging, payment
4	Mobile loan / money transfer	identity, messaging, payment
5	Mobile ticket	identity, location, messaging, payment, profile
6	Reverse charged calls and messages	call, identity, messaging, payment
7	Machine-to-machine	call, identity, location, messaging, payment
8	IPTV	identity, messaging, payment

4.3 Scenario Selection

In the next step an expert group selected only the most promising usage scenarios. Scenarios 1, 2 and 5 received most of the votes. Scenario 3 has limited business potential, and the network-based approach might not be an optimal solution for the opportunity. Scenario 4 requires changes both in the regulation of national and global payments, preventing immediate trials. Scenario 6 was found to be useful, but the technical implementation is challenging, due to the required end user inventions. Scenarios 7 and 8 were outside the mobile scope and were left for future studies. The most valued scenarios were further analyzed using the STOF (Services, Technology, Organization, and Finance) method [6]. As a result of the analysis, scenario 5, the mobile ticket, was chosen for final examination. Applying mobile to a commutation ticket has been a popular research topic, but in this scenario the main target was to develop an event ticket that could also be used in commutation. To make the scenario even more attractive, the social network Facebook was chosen for the event management. This was a logical choice, because most of the events, including private ones, are currently published in the Facebook. The mobile ticket scenario provides a generic usage scenario, representing also scenarios 1 and 2, and it utilizes most of the open APIs shown in Table 2.

4.4 Event Experience

The mobile ticket scenario was renamed Event Experience (EE). The original idea was to integrate new features directly to the original Facebook event page, but that was impossible, because Facebook does not allow modifications on the original event sheet. Instead, developers had to create an external application that is implemented into cloud and uses Facebook APIs to gather information on the events. In addition, EE utilizes the operator's location API for navigation purposes, and text and multimedia messaging APIs for ticket purchase and delivery. The payment API was not available due to regulative restrictions. In addition to core services, EE provides support services, such as maps, route guides, traffic timetables, and other tourist information. The EE application includes two different two-sided platforms. Firstly, Facebook itself is a two-sided internet platform that gathers end users and applications together. Secondly, a mobile operator builds a two-sided platform, where on one side subscribers are connected to the mobile system, while on the other service developers and content providers utilize the data provided by the APIs. Figure 5 illustrates how the EE application maps to a two-sided mobile platform.
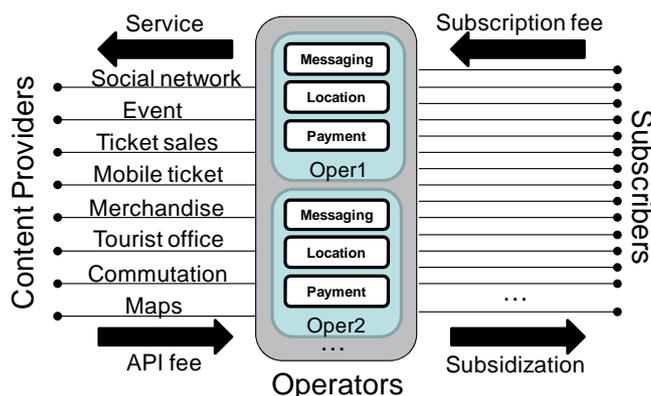
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Figure 5: Event experience and two-sided mobile platform

Figure 6 describes the appropriate value network. The model is just an example, and other service modules can be added when the need arises. In addition to service and monetary links, the system also provides intangible assets. For example, Facebook and public transportation companies do not charge for their services, but they will get indirect revenues from the system. The same applies to Google Maps. Intangible assets and cross network effects can also be found from the cross licensing of tickets both in events and public transportation.
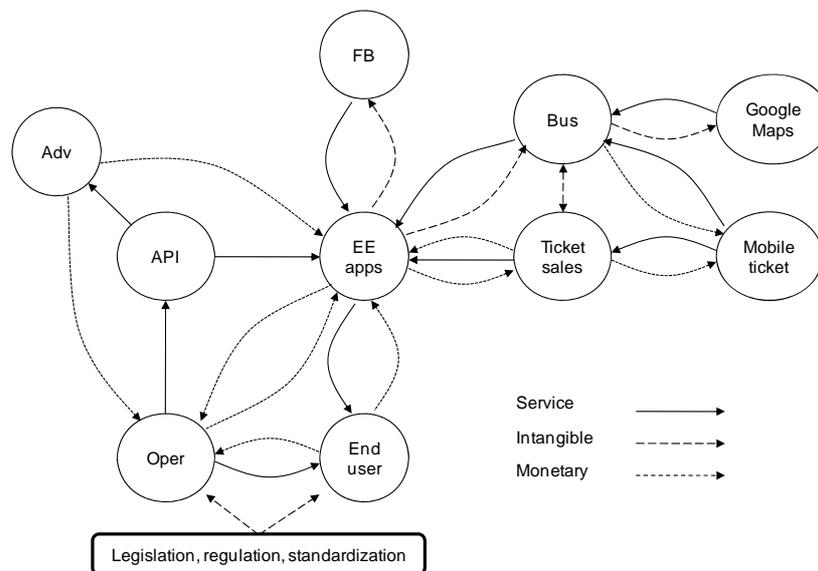

Figure 6: Event experience value network

4.5   Results

The case analysis results of the Event Experience usage scenario are presented in this section within the research framework.

4.5.1   Network Effects

The Open Telco platform provides various positive network effects. Firstly, subscribers can be divided into two main user segments: enterprise and consumer customers. Consumers can be further divided into free and premium customers, where the first group does not pay anything for the service, but the premium customers get advanced services for a small fee. Both the enterprise and premium customers bring indirect benefits to the free users, who receive free services due to the chargeable user segments. Secondly, on the other side of the platform, service providers accumulate network effects both from other service providers, but also from the increased number of users. Facebook itself is an example of the power of direct network effects, but even Facebook can benefit of the Open Telco platform. At the moment, Facebook offers text message notifications only in the countries where receiver pays the message delivery. With the Open Telco's B-party pays option, Facebook could offer the messaging service globally. The same comment applies to the location data. The Facebook Places shows friends' location on the map,

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but only those friends are shown who have a smart phone. The Open Telco is able to locate any mobile user, creating an indirect network effect to Facebook.

The EE application opens totally new, niche events for companies that liked to provide services to them. At the moment, the long tail market is fully invisible, because all kind of small private parties are out of commercial scope. The Open Telco and Facebook together turn the market visible, because anybody can create an event and appropriate ticket and marketing channel in seconds, bringing positive network effects between end users and event organizers. The most traditional network effect can be detected between subscribers and developers. The larger the user base, the more attractive market it is to the developers. Unfortunately, at the moment the limited user coverage is the biggest challenge of the Open Telco, due to lack of national and global roaming agreements. Especially for the payment services the global coverage is a very critical requirement.

4.5.2 Economies of Scale

The Open Telco system incorporates relatively fixed development and operability costs. The capital expenditure of the platform is almost independent of the number of customers. The operability costs can be either fixed or variable, depending on operator's production costs. Basically, operators already have an existing, paid investment to produce messaging, location, and payment APIs, but in certain cases operators have outsourced the service machinery, and they are forced to pay a license cost for each API request. The bigger challenge is the pay-back time of the initial investment for the Open Telco platform. It carries a relatively high capital expenditure cost, due to the integration work required between the Open Telco system and, partly non-standard, operator infrastructures. The developer management system also needs careful design to avoid security or privacy concerns. On the other hand, the operability costs are low and almost independent of the number of users, meaning that a higher user base result in lower prices.

4.5.3 Scalability

The telecommunication systems have been designed from the beginning based on the carrier grade requirements. Open APIs can support high user demand, and if needed, the system can restrict the maximum number of API requests per user. For example, navigation services require frequent location updates, and those services can be beyond the Open Telco capabilities. Text messaging APIs are very efficient due to small size of the messages, but multimedia messages can create challenges. Operators' billing functionality is optimized to a vast number of call data records, and using the payment API for third party payments does not create any problems. Instead, the number of developers must be taken into account. In early phases of the platform, an efficient developer support is crucial. Also human support is needed, although an internet type of self service support should be preferred. Another critical topic is the extension to international networks. It can be challenging to scale platforms designed for 5 million people to countries with 500 million people. The cloud computing principles should be taken into use in the design of the Open Telco system and end user applications to ensure a flexible scalability.

4.5.4 Differentiation

The Open Telco platform is tailored to mediate network resources through open APIs. These APIs are specific to operator assets, but basically the same model can be adjusted to other ecosystems, as well. Although the platform is designed to one country, it can be ported to new markets with reasonable effort. Most of the specific integration work is dedicated to the interfaces between operator infrastructures and the platform, but even these APIs will follow de facto telecom standards. In addition to the communication APIs, the Open Telco platform can manage APIs, for example, from public sector, travel industry and commerce.

4.5.5 Multihoming

The initial assumption is that the Open Telco platform is created together with the operators, and possibly even owned and run by them. In the longer run multiple platforms can be foreseen, when the necessary APIs are fully standardized and market has matured. It is noticeable that in the mobile industry multiple service brokers exist, for example, on text messaging and data roaming services. In both cases the market has already saturated, and global roaming standards have been in place from the beginning. Margins in these businesses are low, but profits are big enough to cover the costs for specialized companies that have optimized their operations upon the need. From the developer's point of view a wider platform selection would increase the competition between the platform providers, which in fact would further lower the prices. The end users would not even notice the multiple platform providers.

4.5.6 Pricing

Depending on the API, the Open Telco pricing model must be versatile. All basic APIs have a heavy competition from other data sources, forcing the operators to compete with the market prices. The operators can charge developers for API requests based on the pay per use principle or by deducting a commission from developer's total revenue. The first approach is applicable to messaging and location requests, while the latter alternative is common on, so called billing on behalf of (BeBo), billing services. In current systems such as Apple's App Store and GSMA's OneAPI trial system in Canada (Site 3), the developer gets 70 percent of the revenue, while the rest goes to the operator and the Open Telco platform provider. This might seem a reasonable revenue share, but in small monetary transfers a commission fee of 30 percent is very high compared to other competitive systems such as credit cards

and PayPal. The pay per use algorithm can be challenged, if the usage scenario requires frequent service requests. In these cases the platform should also provide flat rate type charging alternatives to keep the service production costs within affordable limits. Apart from the basic scenario, the Open Telco platform enables novel business models. On end user's permission the system can provide advertisers anonymized and summarized subscriber profile data to marketing purposes. In return, the platform may subsidize the end users by giving discounts on communication fees or by offering premium services.

4.5.7 Openness

The Open Telco concept is based on the openness approach. APIs are open for any developers, and the technology required is reachable by anyone, even individual user. The APIs are based on the representational state transfer (REST) approach, which simplifies the application development. The developer must register first to the Open Telco developer portal, and after the SMS and email authentication, the system is fully usable. The platform may offer free quota for the development purposes, and also an application store for application marketing, but basically the developer has free hands to commercialize the applications. Unlike the mobile manufacturer specific application stores, such as Android Market, Apple App Store and Nokia Ovi, the Open Telco does not require application verification or approval. In addition, developers may use open network APIs to complement the resources that are available directly from mobile terminals and vendors.

4.5.8 Regulation

The main challenge in Open Telco regulation is related to the payment area. In several countries, including Finland, operators are not allowed to collect payments from other than the communication services, or the maximum payment limit is set to a low level, e.g. 10 euro. However, the discussion is ongoing both in national and EU level, and changes to the laws can be expected. Moreover, the distribution of location data is restricted by the privacy laws. The end users must have a full control to parties who may access their location co-ordinates. This challenge should be solved with a user friendly and secure way. A similar setup is required for the B-party pays option, where the end users must be capable to define the A-party numbers or internet addresses that are allowed to send messages on receiver's expense. Regarding the network neutrality requirement, the Open Telco concept fulfills the required needs. Open APIs do not discriminate against any applications or users. However, operators have an opportunity to differentiate API features. For example, an operator may offer better location accuracy data for its own purposes or strategic partners, and charge a different price for those. But most importantly, open APIs treat developers and applications equally. In order to protect the API resources from being exhausted, operators must set restrictions on the maximum usage of APIs, but those limits must be the same for all users within the same market segment.

4.6 Summary of Results

The results of the research framework analysis are summarized in Table 3. The most critical dimensions are network effects, scalability, pricing, and regulation. The platform must have at least national coverage across the operator borders to enable operator independent services. Payment and travelling services prefer global coverage with roaming features, which require well scalable and standardized systems. The price structure must be flexible to take into account the different nature of the APIs, and the regulation should support the new business innovations.

Table 3: Summary of results

No	Dimension	Result
1	Network effects	Positive network effects available both on same and cross-side, but at least national or preferably a global coverage required
2	Economies of scale	Initial capital investment can be high, but operability costs are low
3	Scalability	Open APIs can support scalability well, but the developer support and global extensions must be planned carefully, using for example cloud computing resources
4	Differentiation	Tailored to open telecom APIs but can be ported to other markets and can support other APIs
5	Multihoming	Not expected in the first phase, requires mature markets with global roaming support
6	Pricing	Must be flexible supporting pay-per-use, flat and variable commission charging alternatives
7	Openness	Fully open, no need for formal agreement or application approval, simple REST technology
8	Regulation	Payment and privacy legislation must be reviewed

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5   Limitations and Future Research

The study has a few limitations. The chosen research methodology was based on a single case study with a representative usage scenario. Although the EE application carries features from several other scenarios, the results cannot be fully generalized. The implementation environment suffered from limitations caused both by Facebook and operator APIs. Facebook forced to create a separate application, and on the other hand, operator APIs were proprietary and provided only by a single operator. The EE application itself was a quasi-experimental prototype without a real user feedback. In this context, the Open Telco system should be analyzed using a multiple case study methodology to present firm conclusions about the two-sided platform ecosystem. In addition, the system should fully support the core APIs, eq. messaging, location and payment, in a live multi-operator environment with real end users. The unit of analysis should also incorporate necessary functions to support the management of end user privacy rules and payment options.

6   Conclusions

Openness enables experimentations [15], and the Open Telco concept [36] is a novel method for operators to attract developers in order to utilize the operators' hidden assets. In addition to basic messaging, location and payment APIs, operators have also other data resources that can be opened for mashups. According to the literature [20], operators should seek the optimal strategy from a hybrid model, and the Open Telco is a typical example of a hybrid approach. It enables innovativeness in a controlled way, but does not discriminate between any applications or users. It fulfills the network neutrality demands [21], and at the same time, open APIs enable operators to restrict the exhausting network usage.

This paper presented a single case study [46] that was applied to the Open Telco two-sided platform concept. The research framework was deduced from the appropriate literature. The research reviewed eight different usage scenarios, of which the most representative case, the Event Experience (EE), was selected for a closer study. The Facebook based application utilizes operator APIs, such as messaging, location and payment, and also APIs provided by Facebook, and a few other service provider APIs. The Open Telco platform provides both same- and cross side network effects [33], [44] that positively accelerate supply and demand side offering [40]. The EE application is a typical example of a mashup that can be described with a value network [35], but on the other hand, the system is not stable [38], and the factors of the value network can be replaced or bypassed, leading to an ecosystem [34].

Despite of the research limitations, the preliminary results of the analysis led to a few conclusions. First of all, the Open Telco platform must support at least national and preferably, especially in payment scenarios, global coverage to maximize the network effects [14] and to cope with internet competitors [20]. Otherwise developers will turn to alternative development platforms provided by the mobile terminal vendors, such as Apple, Google and Nokia. Secondly, the pricing model must be in place on both sides of the system [45]. This is true also for the Open Telco concept. The platform must decide with operators the correct pricing model of APIs, but also the level of commission on billing-services. The usage of customer profile data for advertising purposes is attractive, but end users' privacy rules must be obeyed and besides, end users should be compensated for their data usage. Thirdly, operators have a heavy regulation burden [31], and it would be logical to adapt the current regulative laws to better match the current markets and novel mashup business innovations, for example in the payment and privacy sections.

Open Telco suffers from a chicken and egg problem. Open telecom APIs have not yet attracted enough developers to build up the critical mass, while on the other hand, end users have not found interesting services. The same problem concerns the operators and their infrastructure vendors. Neither party has been convinced of the financial opportunities of the open APIs. One theory on two-sided platforms claims that the critical mass on both sides of the broker is required [14]. In the early phases of the system, this is not the case. One solution is therefore to start with a virtual broker [37] that lowers the start threshold. Another solution is to apply standardization to harmonize the APIs [30]. The success of mobile voice and text messaging services gives an evidence of the importance of positive network effects or externalities. Roaming functionalities have been the key enablers for the GSM success. A similar setup is required for the Open Telco concept for making the system competitive in the eyes of the developers.

Acknowledgments

Yrjo Raivio
Sakari Luukkainen

Websites List

Site 1: Finnish Communications Regulatory Authority
http://www.ficora.fi

Site 2: TeliaSonera financial data
http://www.teliasonera.com/en/News-and-Archive/Reports-and-presentations/

Site 3: GSMA OneAPI
http://www.gsmworld.com/oneapi/

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