Professional MBA
Entrepreneurship & Innovation

Choosing the right strategy for collaborative innovation: An explorative case study in a telecommunication SME

A Master's Thesis submitted for the degree of "Master of Business Administration"

supervised by

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Vienna, 20.07.2018

Affidavit

I, **Carlos Calvo Villalaín**, hereby declare

1. that I am the sole author of the present Master's Thesis, "Choosing the right strategy for collaborative innovation: An explorative case study in a telecommunication SME", 78 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and

   2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 20.07.2018

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Signature

"If you want to be fast, go alone.

If you want to go far, go together."

— African Proverb

Acknowledgements

I could not miss a section like this in a paper having collaboration as a corner stone and thank everybody who have made all this happen.

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And of course to my wife, Regina, who has supporting me during this two years journey and without her nothing would make sense.

ABSTRACT

The role of SMEs for driving innovation is an essential element nowadays for the economic activity. To remain competitive in this changing environment it is necessary to have an alignment between the business strategy, levels of innovation and management decisions. There are sufficient evidences that we are in the midst of a paradigm change in terms of innovation drivers. We cannot consider firm size and financial capital as relevant as in the past since the boundaries of the firm cannot be clearly defined anymore due to complex alliances, collaboration, cooperation and other forms of open innovation models and structures alike in place. This way, the primary source of competitive advantage has shifted from a financial capital centric one to another where knowledge and information are more relevant. The purpose of this study is to analyze the collaboration options and strategy fit in the actual and upcoming context of telecommunications industry SME's.

In the initial part of the paper are introduced different concepts used in the thesis to provide an academically background to address the research questions that conform the thesis. The concept of Open Innovation and the different collaboration taxonomy frameworks are used to better understand distinct collaboration 'flavors'. To analyze the strategic fit, the concept of Value Network is presented in the paper.

The following section of the paper describes the exploratory approach of this research, based on several interviews with managers that have been working in the ICT and telecommunications industry. The answers of the participants have been analyzed using the theoretical background introduced in the initial part of the document to answers the research questions. The final part of the paper addresses future directions and expected changes and challenges in order to adapt the collaboration strategy to the always-changing telecommunication industry.

Findings

The convergence of telecommunications and information industries together with the establishments of 5G as enabler for a global IoT rollout will change the current industries topology in terms of business opportunities. Collaboration will necessary play an even more relevant role in this new economic order due to faster live cycles, the increasing specialization and the need to provide cross-functional services involving different industries domains.

Originality/Value

The main original contribution is the development of an integrated analysis that links company's strategy, innovation and collaboration options in the current context of telecommunications industry. Firstly, to take advantage of the opportunities a new emergent and global industry that IoT represents. Secondly, how to redefine its own identity in a growing convergence process where information and telecommunication industry cannot be distinguished anymore. Thirdly, the introduction of other access network without the exclusivity character as we know it today will necessary remove the closed nature of this industry. Open options in terms of innovation drivers will be become more relevant and so the role of collaboration as catalizator.

Keywords

Collaboration, innovation strategy, open innovation, value network, and telecommunications industry.

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1   Introduction

Collaboration

The cornerstone of this thesis consists of the analysis of collaboration as an inherent aspect in a context of open innovation paradigm shift where to build mutually beneficial relationships is becoming the new strategic challenge. Collaboration understood as required mechanism to build up the necessary links to external entities and actors. Once an organization decides to move towards any kind of openness in terms of innovation organization there are necessarily several implicit questions to be answered. What are the associated risks, how to deal with them or at last minimize their possible. What are the most suitable options? What are the risks (if any)? How to foresee other actors influences in this rising networked economy? What are the inbound (current organization) preconditions or changes to promote collaboration to work?

The amount of potential partners and way to collaborate with them becomes a central question that needs to be faced, if we want to choose the best one that fits into our overall business strategy. This way it is inevitable to deal with **whom** to collaborate (a carefully selected partner or rely on the "wisdom of the crowds"), **where** to collaborate considering the strategic tradeoffs of not developing by oneself new technologies and designs, products or services. Finally, **how** to collaborate, the so-called, collaborative architecture definition defines the structure and organization principles. These are important questions to answer once we want to profit of this innovation paradigm shift. In this paper, it will be introduced different

frameworks in order to help management to deal with this problematic, to better analyze the different aspects related and answer those questions that might arise during the collaboration evaluation process.

The promises of collaboration are high. To name a few, reducing time to market cycles, reducing risks of investing in areas that might not be as successful as expected, helping to focus on the core business, or at least what the company is good at.

Despite the good and promising benefits that we can achieve through collaboration, we should be aware of the challenges and problems associated. The drawbacks cannot be underestimated, the lost of control (depending on the collaboration specific governance option), the complexity and uncertainty of the environment, the possible conflicts of interest that might arise and the changing environment where for example your direct competitor might acquire a collaborating firm. In addition, technological changes often have a drastic impact in the collaboration landscape. Changes of roles could transform a relevant complementary partner into a direct competitor overnight. These factors are examples that show why collaboration decisions might be complex and inherently bound with a risk assessment. Not to mention the current organizational setup and cultural mindset are often an internal barrier to introduce any of the changes this innovation paradigm requires. Besides of the arguments already introduced about how relevant it might be to have a proper collaboration strategy, there are others aspects related to the organization taxonomy and industry that make this research question even more significant.

Different areas have to be considered when it comes to a collaboration decision; these are specifically targeted by the main research question, namely:

[RQ#1] **Which are the relevant collaboration criteria to support your innovation strategy?**

This main research question is complemented with additional sub questions that will help us to structure the research and further analysis.

[RQ#1.1] **What factors have been relevant to shape collaboration, as we know it today?**

[RQ#1.2] **What are the problems and inefficiencies that need to be addressed to improve collaboration?**

These questions address a complex phenome that has different angles to analysis and that might have dependencies to the industry, market structure and regulatory framework. In order to address these questions in the most specific way and bring relevant insights in the topic, it is used a context of an SME's within the ICT/ telcommunication's industry. An area where I am professionally active, having almost 20 years' experience and an extended professional network.

The relevance of addressing collaboration as a central aspect of the research questions is three-fold:

1. First, the importance of the innovation aspect. The relevance and possible benefits of open innovation are numerous: time to market, creativity and innovation promotion in services and products, quick adoption of new technologies, networking effect, etc. This way, innovation is a central activity of every organization, essential to remain competitive, and so the need of collaboration is inevitable in an open innovation strategy.

2. Second, the fact of addressing SME's that the most common organization type that outnumbers large companies and also employ totally more people. Not to mention that SME's are responsible in many economic sectors to drive innovation and competition.

3. Finally the industry, ICT/telecom being one of the major global sectors and therefore its capital intensity relevance. This industry is

currently living a convergence and transformation process where collaboration as mechanism will necessary need adaptations and new interpretations.

The structure of how the thesis is organized is described below:

Chapter 2 .- Theory

Presents a review of existing theory, concepts and relevant aspects related to the topics of collaboration in innovation. Introduces open innovation as strategic paradigm and different classification of collaboration (and co-operation) and fit analysis considerations. It does introduce value network as an important theoretical background in order to understand collaboration in a holistic (industry wide) and networked economy perspective. It is not possible to analyze collaboration only considering the primary actors involved and excluding the networking aspect inherent in a global and interconnected economy. Finally, it presents classification capabilities that are essential in environments or industries that are dynamic or in the midst of a transformation process.

Chapter 3 .- Data collection

Describes the design and explorative approach in order to answer the research questions. The methodology used and the argumentation of the chosen case, and why this is representative. The collected data is presented in this chapter consolidated and organized accordingly to the overall thesis structure.

Chapter 4 .- Data analysis

Presentation of the analysis done based on the data collected in chapter 3. The findings of the thesis and answer of the research questions are developed in this chapter.

Chapter 5 .- Discussion

Summarizes the outcome of the collaboration research, stressing out the limitations of the approach taken, and pointing out further areas of research on collaboration.

2 Theory

2.1 Terminology notes

Before digging into the collaboration bibliography, it is worth mentioning that during the literature analysis were identified other terms like cooperation, inter firm relationship or simple partnering that will be considering for the shake of simplicity different kinds of collaboration in our study. Even though the meaning of these terms might have different nuances (while co-*operating* means working with someone in the sense of enabling: making them more able to do something, typically by providing information or resources they would not otherwise have. *Collaborating* means actually working alongside someone, from Latin laborare: to work, to achieve something..), in this paper, it will used consistently the term collaboration since these do not represent a limitation for the research question. This way, it will considered collaboration as any relation that goes beyond the boundaries of the company driven by the overall value creation.

This chapter is structured in two main parts that provide the relevant bibliography background to back up the exploratory research. Open innovation as paradigm shift considering collaboration as needed mechanism. A taxonomy framework and fit analysis compound this initial section. Second, the introduction of value networks, a valid framework to better understand the strategy fit of collaborating than the traditional value chain approach does.

Finally, although these theoretical parts do refer to different areas in the research question, in the last section of this chapter we introduce some notes to understand how they are related to each other.
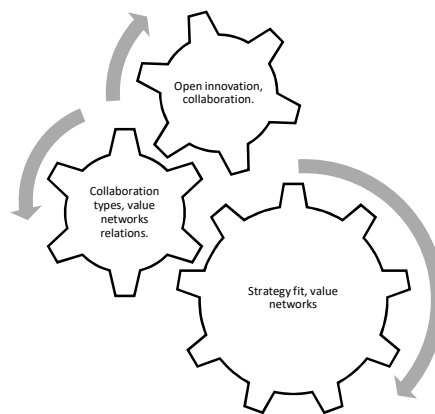
Figure 1 .- Chapter structure (Source: Author)

Collaboration is a complex topic and many-sided that is not good or bad, right or wrong *per se*, it needs to be contextualized, in our case in a context of innovation strategy fit and therefore the introduction of these theoretical backgrounds to provide a holistic approach of the phenomena to address the research questions.

2.2   Open Innovation

In this section, it is introduced collaboration as phenomena within the context of Open Innovation. Open Innovation is typically defined as the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively (Henry Chesbrough, 2003).

It is well accepted among researchers that companies in high competitive and fast-changing markets required of "open" boundaries. The main reason for that is to be able to exchange new ideas, information and experiences with actors who are not located within the company boundaries. The

concept of Open Innovation is not new, already Rosenberg and Steinmueller, stated in the 80's the importance of considering outbound options as a competitive advantage specially related with research and development activities

"Firms that fail to exploit … external R&D might be at a severe competitive disadvantage"

Steinmueller (1988)

Openness and collaboration networks have been a relevant research area by other authors as well, and have become particularly relevant nowadays under the term Open Innovation. Open innovation as known today is a term that was introduced and popularized by Henry Chesbrough in his book Open Innovation: The new imperative for creating and profiting from technology (2003). According to Chesbrough, there are several reasons to become more open when defining the innovation strategy:

- Due to technology, advantages and communication possibilities there are today powerful ways to bypass conventional limitations to benefit from outside firm ideas. (e.g. internet.)

- Speaking about skilled and talented persons, they are spread out in different organization and companies and rarely within the boundaries of the firm. This together by the fact of the rising complexity in all industries and need to multiple skills and disciplines to accomplish every day's work makes even more relevant to know where to find those missing skills.

- Cultural mindset shift where the acceptance within the different organizations to work with external parties (outbound) is accepted and desired. Fact is that innovation that arises from collaboration between different firms, disciplines and fields of endeavor are becoming more common.

- Shorter time to market as product life cycle requires that companies must optimize the time needed for product and services development. This way, to excel at discovering and adopting new

ideas from outside sources and adapting according to the company specifics, it is a valid approach to keep pace with the time to market constraints.

Adoption of open innovation

One important aspect based on the literature analysis is the fact of open innovation as strategy is a reality and has been adopted by large number of firms in different industries, geographic regions and organization sizes (small, medium and large). In the study driven by Chesbrough and Brunswick related to the adoption of Open Innovation, 78% of the executives participating in the research reported their participation in this kind of innovation organization activities. In addition, a similar quote of the executives' interviewed agreed on the raising interest and intensity of supporting Open Innovation as a valid approach for their own organizations. Open Innovation is widely spread and accepted, but so are the adoption possibilities. In the same survey, the different Open Innovation approaches identified were listed and categorized. As shown in Figure 2 the categorization is done considering two dimensions.

- **Direction.** The starting point or perspective of the exchange (inbound if the firm is the target or outbound in the other way around).
- **Compensation.** If there is any kind of economic exchange, pecuniary or not.

These two same dimensional approach has been analyzed by other authors resulting in four different openness types that are also described in the figure below, acquiring, sourcing, selling and revealing (L. Dahlander, D.M. Gann ,2010)
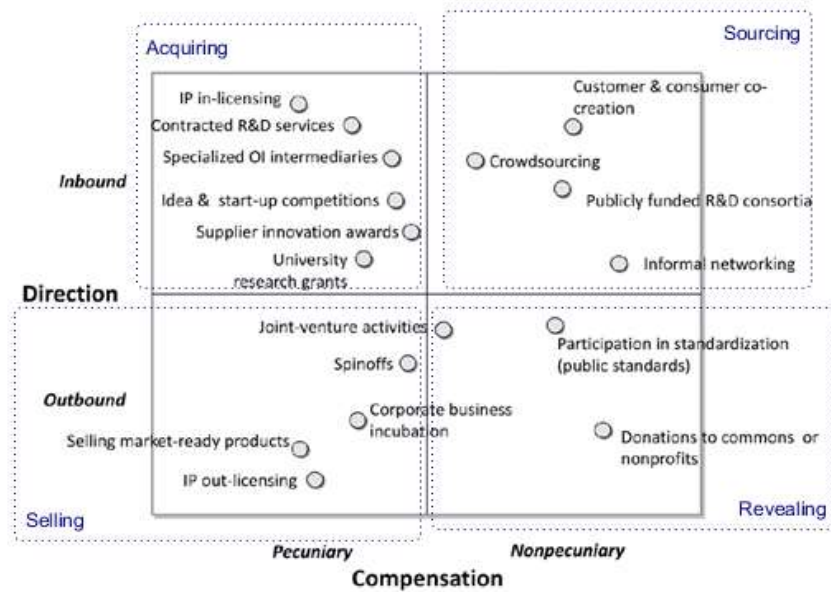
Figure 2 .- Modes of open innovation (Chesbrough 2013)

As good as these open models can be, and as much fervor around some of them might exists (e.g. crowdsourcing), it is important to note there is no one size that fits all collaboration approach. Each of these options have trade-offs that every firm should be aware of. All too often organizations embrace into relationships without considering their structure and organizing principles. Given a firm strategy, what of these open models fits best and how it actually should be structured. This suitability aspect has been covered in the literature and will be further analyzed in this paper.

The taxonomy introduced by Chesbrough uses the compensation and direction dimensions in order to provide a good description of the different options in terms of open innovation. This classification will be complemented in the next section by the one introduced by Gary P. Pisano and Roberto Verganti (2009) that have analyzed this area from the point of view of collaboration, understanding collaboration as a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem.

2.3 Collaboration Taxonomy

The classification introduced by Gary P. Pisano and Roberto Verganti (2009) to understand the different collaboration options and best fits, relies in the concept of collaboration networks. These networks are composed of members and structures that might have an open or close character depending on the restrictions to join them. In addition to the openness criteria, these networks are categorized in the way they are governed. Depending on the decision power, we can define flat networks, where the entire membership is equally empowered or hierarchical in case there is a level and dependency based decision structure. Based on these criteria an as depicted in Figure 3 we can identify innovation malls, communities, elite circles or consortiums.

Innovation Mall	Innovation Community	
A place where a company can post a problem, anyone can propose solutions, and the company choose the solutions it likes best.	A network where anybody can propose problems, offer solutions, and decide which solutions to use.	**Open**
Example: InnoCentive.com website, where companies can post scientific problems.	*Example: Linux open-source software community*	
Elite Circle	**Consortium**	
A select group of participants chosen by a company that also defines the problem and picks the solutions.	A private grop of participants that jointly select problems, decide how to conduct work, and choose solutions.	**Close**
Example: Alessi's handpicked group of 200-plus design experts, who develop new concepts for home products.	*Example: IBM's partnership's with select companies to jointly develop semiconductor technologies.*	

(Participation)

Governance

Hierarchical	Flat

Figure 3 .- Collaboration classification ,Pisano (2009)

There are several implications in the categorization introduced by Pisano and Verganti. In case of closed networks, it works best when the identification of the best solution and the relevant collaborators can be done upfront. On the other hand, open networks suit best if an optima or best solution are unknown, neither the appropriate expert(s). Actually, you do not even need to know your collaborator upfront. Note however, that in this case the potential to attract a large number of ideas and problem solvers is much higher with an open than a close network. This, that can be a benefit, can fire back in form of management complexity. They might not be that efficient in order to identify the best players due to the noise associated of having 'too many options'. This way, in order to make an open network a reasonable choice, there are three criteria to fulfill.

- **Distance.** The distance between the ideal solution to the problem and the average solution provided by an open network should be small.

- **Evaluation.** The efforts and cost to evaluate a possible solution should be low. Sometimes the problem is not to get new ideas, but to evaluate them. In this case, we should follow a closed network, a more qualitative and targeted approach.

- **Participation.** The participation of the members should be easy, meaning low entry barriers for a possible participant and a problem description that can be easily understandable for the 'crowd'. In order to achieve this, a common approach to solve the problem is to split it in small manageable chunks and present them as single options to participate[1].

The second dimension introduced in the classification of Pisano and Verganti is governance. This way, it is possible to define flat or hierarchical networks of collaboration. The distinction between both governance choices relies on the authority conception. This way, in a hierarchical network it is

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[1] Dīvide et īmpera

possible to control the direction of the innovation efforts and profit of the value proportionated. These organizations are favorable if the firm has the capabilities to define the problem and evaluate the solution.

Flat networks are associated to decentralized decision making by different members of the network. The advantage of this approach is the ability to share the risks, costs and challenges of innovating and therefore are suitable for those organizations that don't have the necessary breadth of perspective or capabilities to lead this process. A final remark on the flat networks are the incentives definitions (not necessarily economic) needed in order to attract relevant external collaborators to participate.

Collaboration fit

Pisano and Verganti (2009) undertake a more specific approach to collaboration and analyze the different collaboration types based on participation openness and governance.
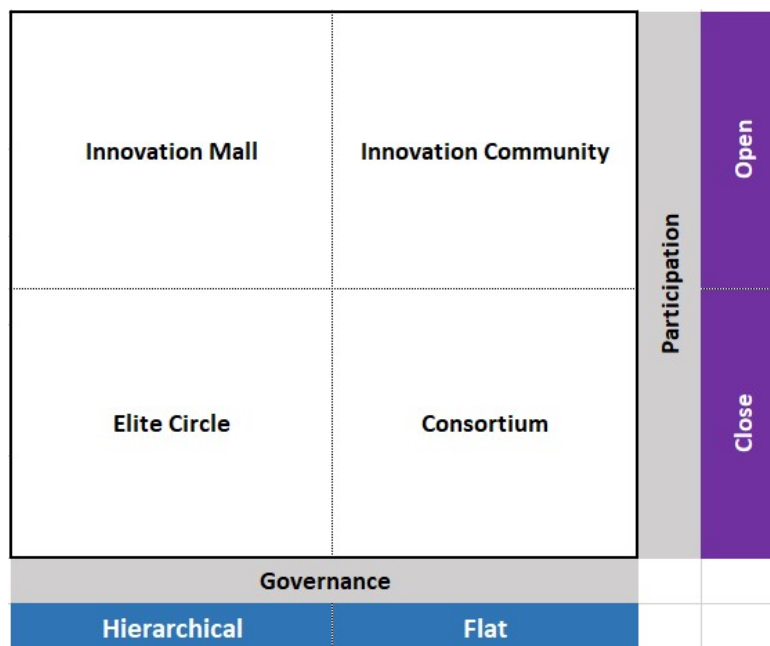

Figure 4 .- Collaboration viability matrix. (Pisano 2009)

Participation	
Open	**Advantage**: You receive a large number of solutions from domains that might be beyond your realm of experience or knowledge, and usually get a broader range of interesting ideas. **Challenge**: Attracting several ideas from a variety of domains and screening them. **Enablers**: The capability to test and screen solutions at low cost: information platforms that allow parties to contribute easily, small problems that can be solved with simple design tools, or large problems that can be broken into discrete parts that contributors can work autonomously.
Closed	**Advantage**: You receive solutions from the best experts in a selected knowledge domain. **Challenge**: Identifying the right knowledge domain and the right parties. **Enablers**: The capability to find unspotted talent in relevant networks; the capability to develop privileged relationships with the best parties.

Table 1 .- Collaboration viability matrix, participation classification (Pisano 2009)

Governance	
Hierarchical	**Advantage**: You control the direction of innovation and who captures the value from it. **Challenge**: Choosing the right direction. **Enablers**: The capability to understand user needs; the capability to design systems so that work can be divided among outsiders and then integrated.
Flat	**Advantage**: You share the burden of innovation. **Challenge**: Getting contributors to converge on a solution that will be profitable to you. **Enablers**: Processes and rules that drive parties to work in concert to achieve common goals.

Table 2 .- Collaboration viability matrix, governance classification (Pisano 2009)

2.4   Strategy and value networks

"Probably the most significant source of innovation does not come from individual organizations or people, but from the collaborative networks that leverage resources and capabilities across multiple organizations or individuals. Collaborative networks are particular important in high-technology sectors."

Hill, C.W., Jones, G.R. and Schilling, M.A., 2014.
Strategic management theory: an integrated approach. Cengage
Learning.

Choosing the right collaboration type involves more than understanding the trade-offs of the specific collaboration type as described in the section above. A firm must take as well into account its strategy for **building and capturing value**. (Pisano. and Verganti, 2008). The role of value creation plays a central role while considering the strategy; actually, strategy has been defined by some authors as **the art of creating value** (Normann and Ramize, 1993). So far, in this chapter we have introduced a taxonomy of collaboration, benefits, drawbacks and suitability. In this section, we will present bibliography relevant frameworks to analyze collaboration from a strategy perspective.

The **Value Chain framework** introduced by Porter in 1985 has been the dominant framework for strategic analysis in the last four decades. Porter's strategic tool analysis contribution has proven to be a valid approach in many industries.   However, under the actual fast-changing competitive environment, in the so-called knowledge economy[2], we cannot consider this

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[2] Economy in which growth is dependent on the quantity, quality, and accessibility of the information available, rather than the means of production and financial resources.

framework as a valid approach anymore. This model is more suitable for physical assets industries than intangible assets like it is the telecommunications industry. A major strategic challenge is shaping the business from a value chain organization to a more fluid structure, the **Value Network** (Allee, 2000.).

To adopt a network centric perspective as pointed by Schilling and introduced by the Value Network framework seems to be a more suitable approach for our research analysis. Actually we can find in the literature evidences (Li and Whalley, 2002, Evans and Wurster, 200) that support this idea, not only in this sector but others like banking, insurance, news, music and advertising to name a few.

> *"Nowadays, successful firms just do not add value, but they create it. The key strategic task is to reconfigure roles and relations among all the actors across the network between suppliers, partners and customers in order to mobilize the creation of value by new combinations of players. What is new in the way it creates value is by breaking down the distinction between products and services and combines them into activity-based "offerings" from which customers can create value for themselves. But as potential offerings grow more complex, so do the relationships necessary to create them. **As a result, a company's strategic task becomes the ongoing reconfiguration and integration of its competencies and customers**."*
>
> *Normann, R. and Ramirez, R., 1993.) From value chain to value constellation: Designing interactive strategy. Harvard business review, 71(4), pp.65-77.)*

This way, to adopt a network perspective is more suitable to the New Economy organizations, especially those industries that, like in the case of telecommunications, product, supply and demand chain are mainly digitalized. Drawing upon this argumentation and specifically in the case of big mobile operators that traditionally have (and still do) all relevant functional units under the same organization (insourced), there are evidences that this might have a negative innovation influence. These functions, customer relation, network infrastructure operation and product

and service commercialization might be negatively affected due to some limitation factors within the same organization. For example to avoid cannibalization, or simple given by internal technical limitations that could be easily amended by using an open innovation approach. This way, authors like Genschel (1997) defend that fragmentation can improve the co-ordination and promote collaboration in the telecommunications industry.

Also as pointed by other authors (Sekino et al. 2005) the split of these functions (fragmentation) is starting to be a wide reality in this industry[3]. As a matter of example, we can use the rise and establishment worldwide of Mobile Virtual Network Operators[4]. Virtual Operations are new actors in the telecommunications industries that do become their competitive advance by focusing in the customer relationship, retail channels and brand management instead of the operation of the wireless network infrastructure.

The concept of Value Network

Verna Allee defines value networks as those relationships that generate both tangible and intangible values through complex dynamic exchanges between two or more individuals, groups or organizations. Any organization or group of organizations engaged in both tangible and intangible exchanges can be viewed as a value network, whether private industry, government or public sector. (Allee, V., 2003. The future of knowledge: Increasing prosperity through value networks. Routledge.)

This way, a value network is made of **complementary** nodes and links, understanding nodes as the different actors or roles involved in the specific industry, starting with the end customers, but also technology vendors, solution providers, partners and the like. The word "complementarity" is essential to understand this concept. Although each of the nodes that

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[3] Telecommunications.

[4] Mobile Virtual Operators are Operators that do not own their the wireless network but provides their services by sharing the existing Mobile Network Operator wireless network.

composes a network can actually act independently, the relation among them defines their competitive position. The key to value creation lies in understanding how this relationship is created (Blankenburg Holm et al. 1999; Anderson, 1995). A service that is provided over the value network requires at least two, but usually more network elements. Not only the structure but also the relations between elements are essential to the competitive position (Madhavan et al., 1998)

Value networks are a valid mechanism to conduct analysis of financial nature (also called financial value, represented with contractual character relations among the value network nodes), but also other analysis having an informal character of positive nature like knowledge exchange, favors, benefits, but also negative, like conflicts, dependencies or exclusivity. This way, value networks are capable to represent not only traditional business transactions but also other relevant exchanges that are intangible and are as critical as the traditional quantifiable aspects involved in a direct commercial transaction.

The key to create **trust** and allow the needed open environment to promote the exchange of new ideas and innovation pathways are actually these informal exchanges. These exchanges, that have been hidden under traditional business practices[5] are now visible and can be considered to perform a holistic value network analysis and help to define valid collaboration strategies.

One further aspect covered by the value network framework is its dynamic nature. As it happens in the networked economy, the action of one participant might have an impact or reaction in other participants. This way, it is not enough to consider the bilateral collaboration agreements between your organization and a counterpart, but have a broader view of the

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[5] Like value chain approach.

implications by analyzing the effect on the end customers, competitors, other suppliers and any other player present in the network. This way, it is essential to be able to have a good understanding of the relations and dynamics of the industry among all the members involved in the network so we are able to:

- Locate where the value is, or at least where this value can be created together with other members in the network.
- Evaluate the impact of the actors' activities and relations.
- Also, evaluate other member's movements and impacts.

From a strategic point of view, the shift is essential. In a value chain approach (Figure 5), the most relevant aspect to consider is in which place to position the firm within the value chain.
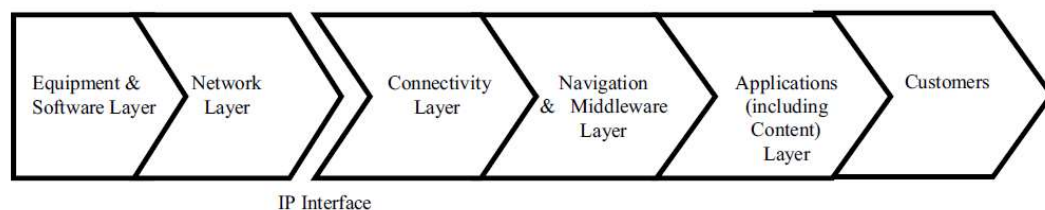
Figure 5.- Six fold categorization of Fransman (2001) telecommunications industry

While in the network value approach, the focus is not in the firm itself but the value-creating system, understanding as such with which actors to work together, collaborate, to co-produce value. This way, leaders and management should consider the health and wellbeing of their network and the individual partners that compose it to be as important as their own company does (Iansiti, M. and Levien, R., 2004. Strategy as ecology. Harvard Business Review, 82(3), pp.68-81.)
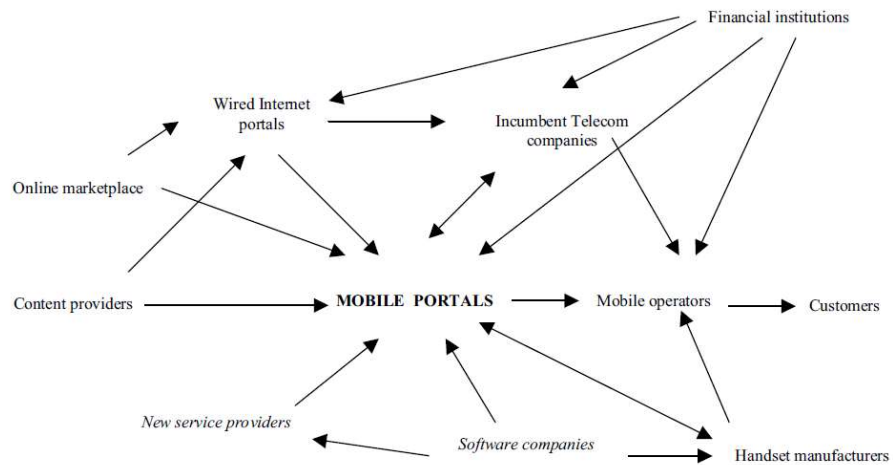
Figure 6 .- Value network of a mobile portal (Iansiti 2008)

One important element within the Network Value Analysis is the network focal (NF) that can be defined as the organization (firm, or any other economic unit) whose business model relies on the network to consider. In order to complete such analysis, we need to define the Value Network first by following these steps:

1. **Network boundaries**

This initial step in the analysis is meant to define the network boundaries from the Network Focal perspective.

2. **Participants**

Next step needs to be done by also having the network focal as reference. It consists in identifying those participants or actors that influence the value that the end-customers of the network focal actor receive. Typically these are suppliers, competitors, channels, regulators, technology and software providers that exist in the **NF**'s current value network and have a direct influence on (or are affected by) its customer's value proposition.

3. **Linkages**

Last step focuses on identifying the nature of the nodes relations. These relations between members in the network might be of different nature

(commercial, content, affection …), however we will consider only those that are relevant for the value dimension identified in the former step. These linkages are commonly referred as influences, stressing the modification capabilities of the nature of the relation. This way, an influencer could be defined as any relation that can have an impact in the perceived value of any of the participants. Tichy and Fombrun, (1979) identify different influencers

- **Exchange** of goods and services. (e.g. software)
- **Affection**, like customers attached to a brand. (e.g. those customers attached to Apple products that buy iPhone devices)
- **Cognitive,** ideas and information exchange. (e.g. business ideas)
- **Prescriptive,** or regulatory (e.g RTR in Austria)

A network value representation, as the one shown in Figure 6 .- Value network of a mobile portal provides a visual description of the value network of a mobile portal. The key aspect in this initial phase is to have a good understanding of the value dimensions of each actor (Refer to Step #3) and how other members influence this. Note that end customers are normally the key in terms of value creation in this kind of networks.

Value Network Analysis

Once the Value Network is defined, it is possible to start the analysis. Referring to the initial research question, performing the analysis in a Value Network becomes essential to choose the right collaboration strategy. Defining the nature of the single relationship is only one aspect to consider. In addition, it is essential to have a network, Value Network, perspective in order to answer the initial question.

Value Network Analysis (VNA) as described by Peppard (2006) aims to **identify where value lies and how this value is created**. Once the roles

and deliverables have been identified and effectively mapped, it is possible to start the analysis of the Value Network. This process is done considering four main aspects, namely Exchanges, Value Flow, Impact and Value Creation.

Exchanges.

Under this aspect, we have to focus in the overall pattern of value exchange (considering the network as a whole). Questions like, how healthy is the network? , how well it is converting value? , are addressed under the exchange aspect.

The exchange analysis focus at patterns of role interactions and value exchange throughout the Value Network. The questions addressed in this phase are grounded in system thinking, living system theory intangible asset management and classic network analysis and it is best conducted via a dialogue and conversation (Allee, 2015).

Important indicators that are helpful to understand the underlying patterns of exchange in the network are:

- **Resilience**, an indicator in the network to respond to changing conditions. It requires of the right balance of formal structure (normally given by the tangibles exchange) to informal knowledge sharing (defined by intangible variables). This way, the ratio tangible/intangible deliverables is a good resilience indicator.

- **Reciprocity** is an indicator on symmetry within the roles relationships. Symmetry (reciprocity) add stability in the ties, and is more "equal" or "stable" than other networks having asymmetric relations. Normally, asymmetry is a sign of hierarchical structure.

- **Risk and role dependency**. In Value Networks Analysis, the existence of too much structural dependency on a role (the so-called centrality), it is considered as a risk for the network. Role dependency tends to correlate to the network variance[6]; these roles might represent a bottleneck for the network value flows.

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[6] Considering variance from a statistical point of view that measures the spread of a sample.

- **Agility**, which indicates how quickly information can move around the network.

- **Stability**, defined by measuring network density, a ratio between existing roles connections and total potential relationship. High density normally shows a levels on social capital, while lower density might point to social capital constrains.

Value flows

This part of the analysis focuses on how well the value flows through the network, and it's optimization helps to allow effective value flows or workflows specially where there are many different possible options (read pathways). This question extends operational thinking beyond a traditional approach (process centric) to a complex adaptive system that is more suitable in case of multiple flows, intangible floes and variation in the flow. Within the flows in the network it is possible to optimize individual transactions and group of transactions. This can be done by analyzing the transaction speed, understanding transition speed as the time it takes to all transactions in a specific flow and the most appropriate channel usage, related to the most suitable technologies and infrastructure in place to support the different flows.

Transactions				Optimizing Transactions		
Deliverable	Nature of Deliverable –Intangible –Tangible	Comes from (role)	Goes to (role)	Sequence Number	Speed of Transaction –high –medium –low	Channel –Email –Phone –Web conference –Team workspace –Shared application –Workflow application –Face-to-face meeting –Instant messaging –Physical transport

Figure 7 .- Data table for flow (Allee, 2015)

Impact

The questions in this part of the analysis helps us to understand how well are inputs that we receive on the network being transformed into valuable assets (financial or not). The Value Network Analysis considers tangible as well as intangible interactions in order to understand how value is created for us and other stakeholders. This initial analysis level helps to figure out whether an actor is realizing value from their inputs.

Value creation

This final analysis is about optimization, to find the best way to create, extend and leverage value not only in the network but also beyond. First, it will be analyzed how well are the current asset utilized and second, how is value created beyond our network itself. Here we have to consider not only the industry but also society and other stakeholders.
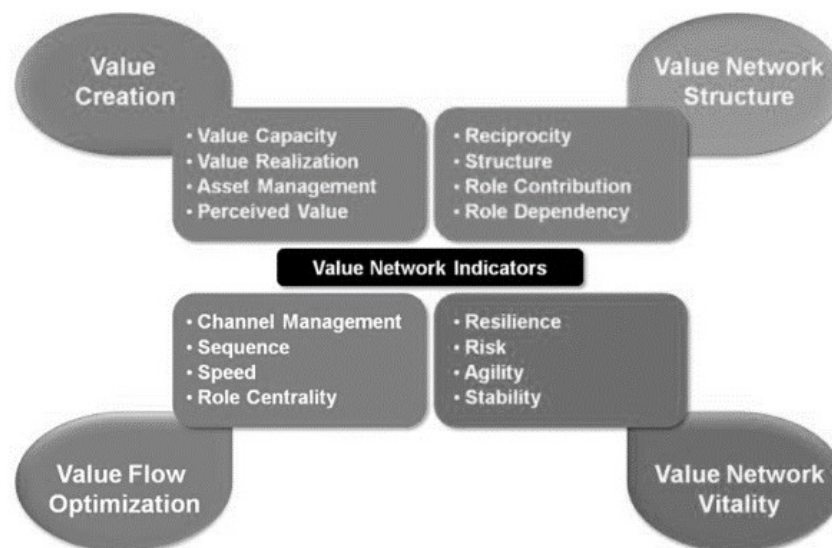

Figure 8 .- Value network indicators (Allee, 2015)

Value dimensions

The aim of this analysis is to generate a description on where the value lies, however we need to consider that the concept of value should not be considered as absolute. Note that something that might add value to one actor might be irrelevant or harmful to others. Value is a concept that depends on how this is perceived and these steps should consider how different actors perceived it. The main objective in this step is to capture the different actor's value (perceived value).

2.5   Collaboration types and value networks

"A value network is any set of roles and interactions that generates a specific kind of business, economic, or social good through dynamic exchanges of tangible and intangible value. It is a human-centric, role-based, network view of any business activity."
(Allee, V., Schwabe, O. and Babb, M.K., 2015. *Value Networks and the true nature of collaboration*. Meghan-Kiffer Press.)

Linkages represent within the value network relations between nodes. Some of the linkages in a value network are given, but others can be shaped with different collaboration options already introduced in the paper. It is possible to find relations between the taxonomy of collaboration and the categorization of networks as described by Kurtz (2003) where introduces different networks topologies based on the governance requirements and network relevance. This way, it is possible to identify these four networks and complexities:

- **Simple Order** - that typically represent a business process, where the influence of the network might not be as relevant as the organization of the process itself (hierarchy definition)
- **Complex Un-Order** – dominate situations that are highly contextual, (meaning too many options and variables to control) like develop a new business strategy or understand the dynamics of a

market. In this case, traditional control mechanism and structures are not the best in order to allow the flexibility these environments might need.

- **Complicated Order** - best suitable for environments with high degree of complexity (e.g. build a space shuttle) or markets that emphasize traditional structures and methods, where different actors need necessarily to collaborate each other, but at the same formal structures are important.

- **Chaos** – where change is the only constant, everything is in change and order is emergent. A typical scenario that truly represents chaos is a large-scale disaster. In these circumstances, single entities can be locally effective through weak networks.
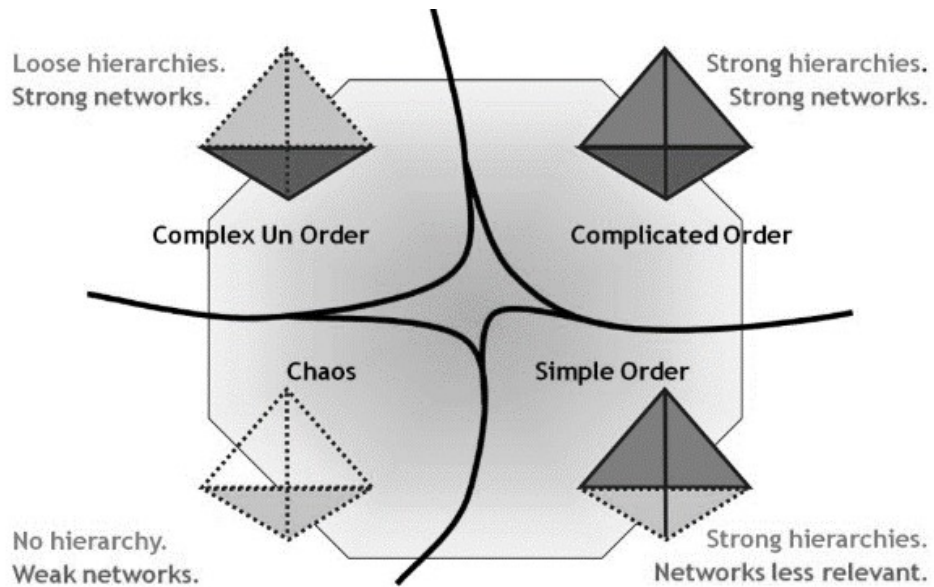

Figure 9 .- The new dynamics of strategy (Kurtz, C.F. and Snowden, D.J., 2003).

# 3	Research design

*"Those who cannot remember the past,
are condemned to repeat it."*
- George Santayana

In this chapter is it introduced the research methodology used for the thesis and collected data. The approach used to address the research questions is primarily **qualitative**, an observation method to gather non-numerical data but the meanings, definition concepts, changes and characteristics of collaboration and innovation strategy fit. This approach is justified in order to discover the **why, when and how** of collaboration, focusing on SME's in the telecommunications industry. Considering the nature of the research questions this is an appropriate approach to initiate the study and formulate additional question for further research.

It has been additionally chosen a case study research method approach, which has examined 'purposive samples' by focusing in long experienced managers that have been actively working in the telecommunications industry under different organizations, most of them as founders and business entrepreneurs, but having also experience in well-established enterprise businesses. One of the major challenges in a case study thesis is connecting the initial research questions with broader theoretical themes and empirical concerns of the existing literature. This analysis is done in next chapter, where it will be referred to the theoretical framework introduced in the second chapter. For gaining qualitative information about the participants' experience, opinions and views on the topic, in-depths interviews with all of them were held. This approach is probably the most flexible and widely used especially in qualitative method approaches. The interviews performed have been semi-structured, which uses an interview schedule to keep some control of the interview, but it allows adaptations based on the interviewee's feedback. The aim of doing the interviews this way is to explore the interviewee's opinion and perception on collaboration.

3.1 Data collection methodology

The data collection was done during the months of April and May of 2018 via face-to-face interviews or phone calls having a duration between 60 and 90 minutes. Every interviewed was informed of the research questions and got a roughly structure of the questions upfront, in order to make the interview more effective.

Interview structure

The main questions addressed in the interviews aimed to focus on these three main areas of interest.

- **Changes perceived:**
  What are the changes experienced during the professional career in regards of collaboration, and the reasons of this changes. These questions aims to recognize any patterns in the industry, business models, technology … that have had an impact in the phenomena at stake.

- **Experience and results, 'best practices learned', collaboration criteria analysis.**
  Based on the experience, what are relevant aspects to consider, when it comes to collaboration? What are the results? Did they fulfill their expectations? The reasons to initiate a process of this nature, the different options and criteria used to make the decision, the problems associated and results of the collaboration experience.

- **Expected changes and aspects to improve**
  Finally, questions meant to figure out the expected or desired changes to cope with some of the existing problems and which aspects are expected to be modification drivers in terms of collaboration in the near future.

The approach taken to structure the interview covers a time frame of the last 30 years that aims to address those aspects related to collaboration that

have changed during this period. The telecommunication has evolved from being a young emerging industry to a mature one, facing new challenges in form of digital transformation, convergence process (information and telecommunication industries) and global deployment of the new Internet of Devices (aka IoT). To have an exact list of some of the questions used for the interview refer to Annex B.

3.2   Interviewees

The criteria to choose these participants is described below:

- Be part of my professional[7] network
- Extended experience in the telecom sector (senior profile)
- Management position, having dealt directly with collaboration (partnership, acquisitions, merge, partnering by grounding an firm …)
- Heterogeneous geographic location and company profile.

In total there were six interviews conducted (listed chronological to the interviews):

Interviewed	Profile	Experience (in years)	Current Position	Based Location
Ian Ginn[8] [IG]	Telco business development. Innovation catalysts	~30	C-Level	UK
Theodore Martin Martin[9] [TMM]	Serial entrepreneur Enterprise communications R&D Telecommunications equipment OEM & technology partner	~30	C-Level	FRA

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[7] I myself have been almost 20 years working in telecommunication sectors in different firms and fulfilling different roles.

[8] https://www.linkedin.com/in/ian-ginn-0103551/

[9] https://www.linkedin.com/in/theodore-martin-martin-7aa49710/

Clive Grethe[10] [CG]	Telecommunications (MNO) ICT/Cloud computing	~30	Senior Management Technical Lead	UK
Christian Weiss[11] [CW]	Enterprise communications R&D Telecommunications	~30	C-Level	AT
Reinhard Grimm[12] [RG]	Enterprise communications Telecommunications Public safety	~20	C-Level	GE
Michael Sedlacek[13] [MS]	Telecommunications Consultancy Testing Solutions	~20	C-Level	SK

Table 3 .- Interviewed profile summary

3.3   Collected data

Out of the answers given in the interviews, it was gathered five main sections that will help us to answer the initial research questions:

- Changes perceived in the last 30 years in the way collaboration takes place and the specific reasons in the telecommunications sector.
- Drivers and collaboration motivation that during this period have justified the collaboration in one or another way.
- Collaboration choices and criteria.
- Problems faced and best practices learned from the experience.
- Current challenges and expectations on collaboration.

Perceived changes

There are different patterns identified in the interviews related to the collaboration evolution in the last 30 years:

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[10] https://www.linkedin.com/in/clive-grethe-54565/

[11] https://www.linkedin.com/in/weiss-christian-87133b86/

[12] https://www.linkedin.com/in/reinhard-grimm-8504566b/

[13] https://www.linkedin.com/in/michael-sedlacek-45784024/

Frequency, options and complexity. Collaboration as interfirm phenomena was less common in the past than nowadays. All the interviewed agreed on accepting that even though collaboration has been always present in their careers, with the time it has become more frequent, but also more complex. Motivated by the dynamic and extension of the telecommunication landscape, with additional actors involved nowadays, than it used to be in the past. This new scenario offers automatically more options to evaluate no matter if the motivation is technology, product complementarity, knowledge exchange or market expansion.

Cultural, internal acceptance. Having in the past, especially in R&D centric organizations, a high level of internal resistance in getting involved into technology-based collaborations, than it does nowadays.

Strategic shift. Collaboration seen as an option and nowadays a need and integral part of the strategy definition of every enterprise driven by the change of strategy focus. In the past, especially bigger solution vendors, tended to keep internal competencies and placed closed ecosystems on the customer to achieve a strong position, where possible collaboration was subject to the vendor.
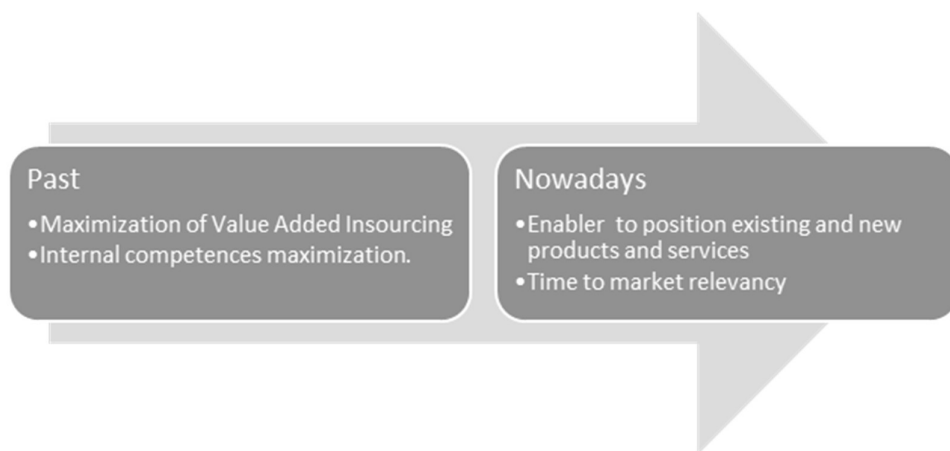

Figure 10 .- Strategic shift (Source: author)

The reasons pointed out in order to explain these changes vary from regulatory changes, markets development, customers' needs changes but also technology:

- Market liberalization

Starting in the US early 80's , and continuing with other Asian and European markets, deregulating telephone services has been the holy gray of free marketers. This way, the telecommunication industry, typically a state monopoly, was liberalized with new entrants licensed to compete each other. Strong regulated markets in country level that had specific local regulations plus strong certifications requirements made it hard especially for SME's to address other markets than the home market.

> **[TMM]** *" … beginning of the 90's to cross the national borders was a real challenge, even to deliver equipment from here (France) to Germany it took lots of time, money and paper work. Nowadays we can do most of our work remotely"*

The complexity due to the strong liberalization process that started taking place end of the 90's by initiating MNO license bidding in every country and later on by changing the legislation to promote competition by forcing MNO's to open their networks bringing new players into the market (e.g Mobile Virtual Network Operators).

- Product and service Life-Cycle

Time to market has become one of the most competitive advances and innovation drivers. Former telecommunication products life-cycle were traditionally considered to be in a range of several years (5 to 20 years were usual) where current services life-cycle expectations are in months range (3 to 36 months) (Allee, 2006). With this timing requirements, insourcing has become in many cases not an option anymore, but to evaluate other scenarios out the organization boundaries, like collaboration, a must.

[CW] " … even though we had the knowhow and skills to develop this hardware based solution by our own, we decided to collaborate with [CompanyName] and focus to develop the applications (voice related applications). This move, back in the 90's, allowed us to place this product very successfully and faster than other competitors. It was a good decision and partnership that partly still remains."

- Standardization

Starting as an European initiative, the standard for Global System for Mobile communications (GSM) defined by the European Telecommunication Standards Institute (ETSI) was the predecessor of what nowadays the majority of cellular networks worldwide follow. An important role of this body was to define open interfaces and architecture frameworks to guarantee the interoperability needed by a service of this nature. Also to avoid the silo and closed ecosystems existing in the telecommunications enterprise environment, where big global players control the complete market leaving no place especially for third party vendors extensions (mixed deployments). ETSI standardization enabled to have the radio network subsystem from different vendors, core networks or the operational and maintenance subsystem from a third party.

- Technology, Hardware to software based development.

There are two main technological changes mentioned that have had a clear impact defining interfirms collaboration.
First, the hardware centric solutions, where lots of the logic and implementation was done in hardware. The fact of SME's developing in Hardware the services required in the telecommunications industry and the lack of clear interfaces (open interfaces) generated closed ecosystem setups on the customer side. This situation on the one side bounded supplier and customer in a long-term relation, on the other side it was not feasible to add additional services of third parties (killing any collaboration options)

[TMM] "For me the tipping point was the change of implementing the services in software instead of developing hardware, like VoIP and the irruption of internet that enabled the possibility to exchange software in a cheap and fast manner"

Second, the general irruption of internet at the end of 90's and the possibility to exchange software over the network with minimal costs, time latency and reliability. Nowadays it is common that even small firms do have some of the services outsourced in a company located in a different country.

- Collaboration software

Drawing on the last argument, the general introduction and usage of email, conference solutions and other collaborative tools have made this interfirm collaborative work possible.

[CG] "…these tools are just enablers, but essential to work with teams around the world."

3.4   Collaboration drivers

When it comes to the reasons of starting a collaboration process, there were two motivations mentioned consistently by all participants. New markets and new technologies (read skills, products) that would have taken too long to develop (time to market) or that were not viable (developing it myself would cost me more than buying it).

- Technology

To introduce a new technology, service or product in the firm's own portfolio is a strategical move to remain competitive. As mentioned in the former section, one of the major changes experienced in the industry was its liberalization process. Before this process started, the telecommunication

industry was structured in three well-defined layers (equipment, network and service layer) where the equipment and network layer were de-facto tied together in a "closed, long-term" relationship between the operator and the network technology provider. With the liberalization and introduction of additional competitors, and especially the introduction of internet-based technologies, the industry has changed from a three-fold layer structure to a multi-fold[14] layer. This new industry structuration has promoted the collaboration between those actors that are specialized in one or another service or technology and those that provide end-to-end solutions. This kind of collaboration setup is very common nowadays, especially considering that SME's normally have a limited portfolio and the services required in the industry have become more complex.

Another reason mentioned in the interviews that justify this technology driven collaboration for SME's, is a clear strategy to offer complete solutions and not just component and compete this way with bigger players, typically global players that are capable to offer complete solutions and follow an aggressive pricing strategy. In addition to this argumentation, the need to offer more additional services in a saturated market makes the innovation process to be bound with an additional complexity. Fact is that the ARPU worldwide for traditionally telecom services (Voice, SMS and data traffic) is declining. Operators are pushed to offer new services where the customer is ready to spend more. Finally, and as closing argument provided for a technology driven collaboration is the fact of risk minimization. As pointed out by many of the interviewed, we have to consider that in a highly dynamic industry, as the telecommunications is, it is often crowded by promising services and technologies that never reached the initial expectations. To name a few that might be familiar to any mobile phone user, WAP, HSPDA,

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[14] There are authors that identify up to six layers, namely equipment and software, network, connectivity, navigation and middleware, applications and finally customers. (Fransman, 2001)

Push2Talk, MMS, and also in the in the network side, OSA Parlay[15], RCS[16] or the GSMA initiative to start a Telecommunication Marketplace[17] starting in 2015 and shut down in April 2018.

- New markets acquisition

Together with the technology complementarity reason, access other markets (read clients or geographical areas) is the main reason mentioned in the interviews to start a collaboration.

> **[IG]** *"… in terms of market size, the EU is comparable to US market. However, while in the US four operators are covering the complete market, here (in Europe) we have hundred, three to four operators per country"*

Despite the strong regulation that rules the telecommunications section in Europe that promotes the liberalization of the sector, fact is the telecommunication section is still strongly regulated in each country with a national agency (to name a few, RTR in Austria, BNA in Germany, ARCEP in France or OFCOM in UK)

On the one side, this market fragmentation allows the possibility that many small players exists, on the other side, it is a very complex market structure to scale up. Often the specific country regulation and the non-existing presence in the country (something very often-in SME's that lack of a international presence) are a barrier to address other markets besides of the home country.

An important aspect also related to this commercial centric reason to start a collaboration is the role of procurement, a function that is present in any

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[15] An Open API for the telecommunication network that had a very limited impact in the industry.

[16] Rich Communication Suite,

[17] https://www.gsmamarketplace.com/index.html

Mobile Operator and bigger vendors, typically as a own department or organizational entity.

It is common to have to partner with bigger firms in order to be able to work in a project for a third company (e.g. Tier 1 operator)

[CW] ".. in order to be able to place our service platform in [Tier 1 Operator] we had to partner for this project with [Global Vendor], even though the product was entirely ours. It would have taken too long to go through the procurement process to offer the project directly…. However these relations [Global Vendor – SME's] are difficult to maintain, since the business focus and strategy fit between global players and local SME's are difficult to align."

3.5   Collaboration scenarios

[TMM] "back in 2000 we had the possibility to acquire [company], that had an interesting technology at that time, VoIP. Even though our company was very successful in Unified Communications and IVR (Interactive Voice Response) solutions, we decided to extend our portfolio with VoIP capabilities. This way we finally decided to merge both firms. It all went good, few years later we were very successful selling our standard products based on IP technologies. I do not think they would have managed to sell that technology to our customers without us. But we would not have been able to grow as a company without that technology in our portfolio. This was definitely a win-win experience"

In this section are summarized the different kind of collaboration types experienced and relevant aspects and criteria to consider when it comes to a collaboration.

Project scope, no choice. Within the telecommunications landscape (also in other sub-sectors within this industry like public safety) the possibility to get involved in green-fields projects is small. Most of the projects do necessarily replace or extend existing systems already in place. This way, it is common to have some partnership fulfillment clause as part of the contractual conditions.

Nowadays operators (MNO's) typically have operative areas outsourced, e.g. (infrastructure operations) and additional services should be operated or hosted by a third party (outsourced company). These multi-party setups are becoming more and more frequent. In these scenarios, it is not possible to talk about best-fit criteria since the collaboration partner is given, but best practices:

- The definition of detailed SLA (Service Level Agreements) with responsibility matrix and escalation procedures definition and responsible entities becomes essential.
- Adaption of given processes, in the case of operational processes (read ITIL) alignment is also required. This way, it is important to avoid having strong support processes internally and promote the flexibility and minimal commitments when the processes involve external entities (e.g. customers, nominated partners).

Project scope collaboration. The rise of the complexity of every project in the telecommunications areas can be measured using different metrics, scope, functions and boundary conditions. The co-existence of different technological generations (2G, 3G and 4G networks with an imminent rollout of the next generation, 5G) plus the amount of services offered and lack of standardizations in the IT landscape, are partly the reason of this complexity. It is common that for some projects the requirements scope is extensive (functionality, support, integration and maintained is requested) and deep (from telco core network integration up to mobile app to service the end customer). For an average SME's it is difficult to offer such a wide range of services, being often the only option to address these projects together with a partner. In this kind of scenario, the initial partner screening is done based on the needed functionality for the project, meaning if the partner is going to be able to provide the required part of the solution in the expected deadline and quality. Even though a company assessment is also important, more often than not, the time required to do that is not compatible with the project schedule. This way, and as best practices, back-to-back

agreements and control mechanism defined upfront tend to be a good option. In addition, these project based collaboration scope are a good proof of concept for further collaboration not bounded with a project but having a strategic character.

Strategic decision.

> [TMM] *"Probably this is one of the most difficult and important decisions a manager has to deal with, with whom to partner"*

This kind of collaboration scenarios are meant to last much longer in time than the previous mentioned, and go beyond of the scope of a specific project or even customer. The reasons to initiate such a collaboration relies on a strategic decision, where the firm decides to use an external firm to fulfill a specific role in the defined organization strategy. This role can be of different nature, but what is a constant is the relevance of the task and timing expectation.

A recurrent aspect mentioned especially with this kind of collaborations is the difficulty to evaluate. Trust becomes even more relevant than in the previous collaboration scenarios. This kind of collaboration implies a loss of control in the company strategy realization (no matter if product development, technology integration or business development). This might have fatal consequences (e.g. the USA announced ban against ZTE[18] to purchase electronic components. Those having strategic alliances with ZTE, like Korean Telecom for rolling out of 5G[19] might need to find alternatives or redefine their strategy.)

This way, it is very important to have a fit in different levels,

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[18] https://www.reuters.com/article/us-china-zte/u-s-ban-on-sales-to-chinas-zte-opens-fresh-front-as-tensions-escalate-idUSKBN1HN1P1

[19] https://www.businesswire.com/news/home/20150715006714/en/ZTE-KT-Sign-Strategic-Partnership-5G-Korea

[CW] ".. it is not just about the product they might have, also their trajectory and cultural fit is something you have to consider. In the end this makes the difference whether a collaboration can work in the long run or not. "

Also related with this kind of collaboration and related to the classification of Teece[20], a way to reduce the risk associated is buying control, meaning equity. This option has however two major problems:

- Often SME's do not have the resources to affort this kind of deals, or at least a very limited.
- This kind of operations often have collateral consequences, since other actors in the telecommunication landscape might interpret this kind of operations as threat (e.g. investment[21] of Nokia on "open-cloud" , where many of the potential clients of "open-cloud" could be considered as concurrent to Nokia.)

3.6   The two sides of the same coin

[TMM] "After paying for more than a year to a business development consultant for selling our VoIP solution in Thailand I got to know that these serviced were still forbidden by the local regulator"

[MS] "In less than 6 months, our consulting business basically disappear because of a regulatory change in the employment law "

One important aspect that was questioned in the interviews was the good and bad experience while collaborating. Even though the overall collaboration experience was categorized as positive, there were negative aspects that need to be considered:

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[20] See Annex A

[21]http://regent.com/experience/regent-partners-international-us-partner-fairmount-partners-announce-latest-transaction/

An uncertainty environment as the telecommunication industry is, what yesterday was a good choice, today it isn't any longer. The reasons collected in the interview are numerous:

- **Technology**. Something that in a highly dynamic environment could happen. The general transformation of TDM[22] based hardware to IP based technology in every operator, starting in a general form in 2010, resulted that many strategic hardware collaborations were not relevant anymore.

- **People**. As mentioned in the interviews, the personal relation fit is a critical component in order to make the collaboration happen and be successful. People (management) changes and so can a collaboration relation.

- **"Made in house syndrome"**

> *[CG] " … as best practice, I would recommend to directly involve your R&D with the external partner, they have to be part of the project."*

Something that probably has changed in general in the overall mindset of especially many R&D centric firms is not to insource as much as in the past when it comes to deal with technical centric development. This however seems to be part of the organization culture. As reported in the interviews, too much insourcing (especially if not aligned with the core competences) in the long term will inevitably end up in an internal over-complexity. To involve from the beginning on in this kind of projects these technical units, seems to be a good approach between strategy alignment, technological competences exchange and people commitment.

- **Acquisition**. Firms, especially if they are small, could be acquired. As mentioned several times, organic growth is challenging in a saturated market as telecommunications is in Europe. Merges and

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[22] Time Division Multiplexing (https://en.wikipedia.org/wiki/Time-division_multiplexing)

acquisitions are common and so the collaboration landscape could change so drastically.

- **Collaterals**. Impact, something that initially should be a good collaboration match, might have some impact that is not expected.

- **Exposure and plagiarism**. Especially with partners having similar skills, profile and expertise and that are chosen in order to serve a distant market.

- **Misleading**. In the end, there is a big amount of trust in the collaboration relationships and this might be misused by any of the collaboration parties. (see the case of the business development in Thailand for VoIP in the section heading)

3.7   Future, areas of improvement.

In this final section are collected those aspects mentioned as areas to improve for the future, or changes that based on the answers will have an impact in the way to collaborate.

Human interactions overhead

A recurring topic in the interviews, when it comes to the future of collaboration, is the overhead in terms of human intervention.

> *[IG] ".. the overhead, the effort, the inefficiency of human collaboration is no longer something people will longer pay for."*

> *[RG] "It is always a long and difficult internal discussion to decide if to collaborate, and if we do, with whom"*

The possible benefits of collaboration have been already mentioned several times in this paper, and are compelling. However, the 'price' of collaborating comes in organizational impacts, decision-making time overhead, control

and trust issues. Besides of the initial motivation to start a collaboration, there are other aspects involved that are inevitable present and relevant. One of them, we can call it infrastructure support (collaborative platforms), are enablers that make this kind of distributed work possible. The other, a contractual framework present in any kind of collaboration[23], where the parties have to agree on. For the first two aspects, the technological support and evolution happened in the last years is astonishing. API integration, automatic testing and documentation generation, distributed continuous integrity services to support complex software development environments, instant messaging multichannel solutions, presence services …

The latest aspect is however, not as standardized, or at least having a strong technological support, as the first two aspects mentioned. A contractual agreement still involves too many human interaction (meaning time) and uncertainty (since it could be biased by the specific persons involved) and in general it is not as standardized as an API description could be.

From components to functions

> [CW] *"… until now the development we have done was based on adding additional elements, IN, Voice Mail, GGSN's… and so we looked for partners. Telecommunications is becoming a data only service and in IoT/M2M components will no longer be as relevant but functionalities."*

Until know the need to collaboration, especially in the technical and service areas, was driven by component vendors that were able to provide a complete solution to fit in the operators' network. The reason for that are most probably the strong standardization bodies behind and the close ecosystems that represented each mobile network operator.

Thinking in functions instead of standardized components will change in some aspects the way collaboration takes place in this industry, possible

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[23] Note that only pecuniary based collaboration where considered in the interviews.

collaboration partners will increase. To scale this up, the whole process of integrating partners should be more agile. In addition, how (business models) we can sell our products (deliverables) will be different.

Other industries and technologies

IoT as emerging new global internet that will interconnect devices, data only operators, virtualization and cloud deployments were mentioned in the interviews as main drivers that will reconfigure this industry in the coming years. This will have inevitable consequences in many areas, in every existing and new actor and in the interactions among them. Only considering the verticality (transmission, security, management, analytics …) and horizontality (car industry, consumer electronics, civil infrastructure, smart cities …) of IoT as new global technology opens a brand new services perspective. That will enable further opportunities to collaborate and to create new business opportunities in upcoming markets. However, it is still unclear where these areas are and where synergies might rise and how the existing telecommunication stakeholders will find valid collaboration partners in these new markets.

4   Results

This chapter is structured in three sections, each addressing the initial research questions, namely:

- Which are the relevant collaboration aspects to support your innovation strategy?
- What factors have been relevant to shape collaboration, as we know it today?
- What are the problems and inefficiencies that need to be addressed to improve collaboration?

To answer these questions the theoretical framework presented in the initial part of this paper together with the analysis of the data collected in the former chapter will be referred.

4.1   Collaboration dimensions and criteria

Collaboration should be considered as an enabler but never as an end in itself, this way it is important to understand the reasons provided in the previous section to start a collaboration. Before that we need to understand where it does make sense and where not. This way, it is essential for every organization to know what the areas are where they are good at, or at least where they do want to be good at. In other words, which is their core business and what are their values. This criteria defines the areas where an organization should not be subject to be involved in a collaboration. More often than not this is not the case and firms embrace into a collaboration partnership on areas that belong to their core business. While others lose

the focus dealing with tasks that are not aligned to their core business. These both scenarios might be a sign of lack of strategy or identity definition. Out of the data collected, it is possible to identify two main collaboration drivers. Either technological (read specific product, component or know-how complementarity) or business development related, in order to reach other markets or new customers. Another dimension to consider in the externalization analysis is the strategy fit required in the collaboration relationship. In case of collaborations that are meant to complement a core value, both the strategy fit and a longer time perspective define the collaboration (open end in time). However, in case of the collaboration is motivated to cover a specific punctual need, for example related to a project, the collaboration is primarily defined by the functionality fit and shorter period involved (closed end, having a defined start and end).
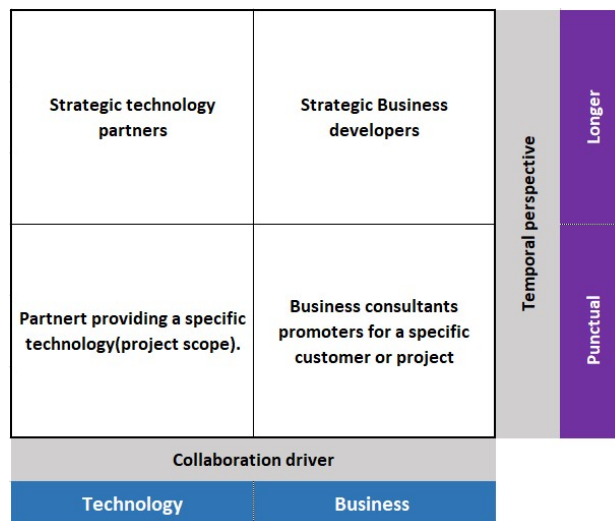

Figure 11 .- Collaboration criteria (Souce:author)

It is not possible to map these dimensions with the taxonomy frameworks already introduced in the paper. What is possible is to contextualize this classification, meaning how these classifications fit together. Based on the collected data, not matter if the collaboration is business or technology

driven, long or short term, in terms of openness the participants defined collaboration options that we should consider rather closed than open. How to solve the problem is known but the challenge relies on choosing the best expert to deal with it. An open approach in this case does not really make sense, because of costs (time and money) and organization overhead (the higher the participants, the higher the complexity).

If we consider the governance aspect in the collaboration options, we can distinguish based on the participants that in the long term (strategy relationship driven) flat hierarchical relations prevail. However, in the short-term relations (e.g. project scope) the governance tends to be more hierarchical, given by the project organization itself. The reason might be a control vs. trust tradeoff. As mentioned in the interviews, one of the main constraints to embrace collaboration is trust. We should expect this way, that strategic relationships where trust gives precedence over control to have flat governance hierarchy, while in a short term relation control will take precedence over trust and therefore we should expect a hierarchical relationship. It is interesting how Teece (1992) introduces the aspect of control from the equity point of view. If we ignore exchange as collaboration option, relevant from a financial point of view but not really for the sake of this paper[24], an equity based alliance introduces an additional control aspect stronger than the strategy fit and trust among the participants. This scenario could be considered as the only exception to the collaboration scope as mentioned in the initial part of this chapter, meaning to buy something I want to be good at can justify a collaboration.

Referring to the modes of open innovation as presented by Chesbrough, we should consider the collaboration types identified in the interviews as inbound or outbound (the direction depends on the perspective of the collaboration counterparts) and mainly pecuniary. Other relations types

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[24] Concerned with collaboration and innovation strategy fit and not financial investments as capital diversification.

seems not to be as present in this industry[25]. A quick google search of "open source software" in different worldwide relevant industries shows that in telecommunications, even though it is a well-established industry, the results are remarkably lower than in the others.

Google search string	Google result
Education open source software	~204M hits
Medicine open source software	~142M hits
Finance open source software	~140M hits
Telecommunication open source software	~31M hits

Table 4 .- Open Source Google hits in different industries (Source:Author).

This is just an indicator, relevant though, that points out that not many open communities are active in this industry. I cannot find arguments that explain why this branch would be less attractive for communities than others. At the end communities are often the origin of open source projects. A plausible justification is the still closed nature of this industry. Despite of the changes that happened in the market related to deregulation and competition promotion, it is still highly regulated and in my opinion, it should be still considered as closed[26], or at least with high entry barriers.

4.2   Changes in collaboration

To analyze the causes that have originated changes in the past on collaboration, it is important to find parallels in the industry and technology status nowadays. This analysis should help to define the collaboration strategy in the future.

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[25] It would be interesting to research why in this industry, although very much technological, the amount of open collaboration options seems to be less than other industries related.

[26] As a matter of example, in a small country like Austria, the amount of MNO's is 4 while the number of ISP's is 37.

Markets and industry

The still strong regulated market of telecommunications, has experienced major changes in the last 30 years. Worldwide we have seen how the different regulators have promoted competition. As a matter of example, by having MNO's to share the radio spectrum with newcomers, the so called Mobile Virtual Network Operators. New players in the operator landscape, that not only have pushed the prices down, but also have brought new services and business models that did not exist in the past. Also, the strict restrictions defined by the regulation authorities have enabled major merges (e.g. Orange [27], H3Austria in 2012) but always having considerations in other to maintain the competition level in the country.

"H3G commits to provide, on agreed terms, wholesale access to its network for up to 30% of its capacity to up to 16 mobile virtual network operators (MVNOs) in the coming 10 years. This will enable MVNOs to offer mobile telecommunications services to end customers in Austria at competitive terms and conditions. MVNOs generally need to enter into a business agreement with a mobile network operator in order to provide mobile telephony services to their customers."

European Commission Press Release Database
Brussels, 12 December 2012

Nevertheless, we still have to consider the strong position in the telecommunication value networks of the MNO's, as they do have the control and ownership of the unique access network (read 2G, 3G and 4G radio network infrastructure) which is required and precondition in order to provide any mobile service.

Technology

The most relevant change in the area of technology experienced in the past, besides of the natural improvement of the different technologies involved in the telecommunication industry (radio access technologies that have

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[27] http://europa.eu/rapid/press-release_IP-12-726_en.htm

improved the network bandwidth dramatically, mobile devices platforms that have raised the performance and user experience tremendously …) , is the paradigm shift from hardware to a software centric solution. This technology shift, has deeper consequences than the strictly needed skills in the different organizations. For years, most of the solutions deployed in this industry were in form of proprietary hardware and closed ecosystems. This approach caused major problems for enabling collaboration. First, hardware is not easy, cheap and fast to ship as software. Second, in closed ecosystems it is difficult to involve other firms than the original vendor, reducing the possibilities to fit a collaboration relation, unless this is agreed with the equipment vendor itself. Even this scenario is normally bound with strong constraints.

Today, more than ever, we can state that every company is a software company. This shift is not exclusive in the telecommunications industry and probably some of the changes experienced in this industry are common to others. Fact is, that most of the solutions build in the past were done in proprietary hardware, and nowadays they are implemented by using open platforms in software. Public API's, standardization of interfaces, technologies like web services are enablers of this shift. As a matter of example it is possible to have an Evolved Packet Core[28] where each network element comes from a different vendor. Due to the software centric solutions the entry barriers for newcomers are low. In software production[29] expertise and knowhow have become more relevant than initial capital investment.

What to expect

As adventurous as it is to talk about the future, it is possible to identify similarities in the industry and technology nowadays. These are expected to add an additional degree of dynamic in the specific area of collaboration.

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[28] http://www.3gpp.org/technologies/keywords-acronyms/100-the-evolved-packet-core

[29] Note the usage of software production, commercialization is another story.

Continuing with the technologies, the next level on virtualization development is taking place right now. The introduction of cloud deployments like OpenStack[30] are a reality, especially in major telecommunications players[31].

> *"Telecoms have turned to OpenStack as their Network Functions Virtualization (NFV) foundation of choice. Numerous telecom providers and enterprise leaders have chosen to implement NFV with OpenStack. These include AT&T, Bloomberg LP, China Mobile, Deutsche Telekom, NTT Group, SK Telecom, and Verizon."*
>
> *Steven J. Vaughan-Nichols for Networking (zdnet)*
> *October 12, 2016 -*

This adoption is bringing a new level of openness in the industry where the platform itself is exposed, defined and available over standardized (and open!) API's. The way to access the underlying computer resources (processing power, storage, networking, databases, orchestration…) is done over software that goes beyond the underlying OS and hardware boundaries.[32] This move will remove the last existing[33] hardware related barriers in the industry. We have to expect that this technology evolution will allow newcomers to offer systems and solutions, especially in core network elements, areas that until now where reserved for big players (Nokia, Ericsson, Huawei, Cisco …).

In addition to the virtualization, other technological areas might influence in the collaboration assessment. With the opening of the access networks due

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[30] https://www.openstack.org/

[31] https://www.zdnet.com/article/telecoms-love-the-openstack-cloud/

[32] Note that in order to fully use the power of this new paradigm IaaS it implies architectural changes moving from monolithic software deployments to lightweight components 'á la' micro services.

[33] This statement is done from the network infrastructure side. From the end user perspective the existence of physical mobile devices will be a reality, even though in this domain it is to expect changes like the roll out of "e-SIM" that will remove the need of having physical SIM's.

to less regulated technologies (e.g. WiFi), it will be possible to have additional stakeholders providing access services other than the mobile operators. Right now, we can consider the radio access network an exclusive domain of the MNO's (typically three to four operators in every country). We already see companies that are starting to provide these services with the pretension to be truly globally as service access providers. To name a few, all of them using different access technologies refer to Table 5

Company	Access technology	Notes
Flexiroam[34]	4G/3G	Malaysian based company that offers a microchip to stick in your SIM and allows you to have data access over the mobile network in more than 100 countries at local rate prices. Business models that relies on a X-Microchip technology to add a second SIM in the phone, and roaming agreements worldwide, webapps plus the dynamic handling of IMSI's and APN's
iPass[35]	Wi-Fi	US based company that provides global mobile connectivity over more than 60M Wi-Fi hotspots in 160 countries. The firm does not own completely the network, but rely on partners in different geographical areas. For the end user, they offer a global Wi-Fi network.
Google Fiber[36]	Fiber optic	Google is Alphabet leading subsidiary based in US is a technology company specialized in services provided over internet (cloud computing, search engines, online marketing). Google Fiber is part of the access division of Alphabet and offers high speed internet access (1Gbps) in 19 cities in the US (some of them over Webpass[37] collaboration)

Table 5 .- Global access network(Source: Author)

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[34] https://www.flexiroam.com/

[35] https://www.ipass.com/ipass-smartconnect/

[36] https://fiber.google.com/

[37] https://webpass.net/

These changes will have major implications that are relevant for the collaboration, strategy and innovation definition areas:

- The introduction of newcomers providing valid alternatives to components that until now were available mainly from big players (e.g. PGW, MGW, SBC, MME …). This will open the possibility to collaborate in order to complement the product portfolio of many SME's with partners that fit better than bigger players did. Besides of the cultural mismatch, normally the company size difference among firms are killers of collaboration.

- On the other side, and as it has already happened in the past, more actors will inevitably push the industry actors to be more specialized in order to distinguish to the others. Referencing Porter:

> *"In contrast, the essence of strategy is choosing a unique and valuable position rooted in systems of activities that are much more difficult to match."*
> Porter, M.E., 1996. What is strategy. *Published November.*

Many actors in this industry will have to redefine their strategy, the core business and where the firm wants to excel. Not to mention that in this scenario, with more actors and more specialization, collaboration as mechanism will become even more relevant as it is nowadays.

- In regards of innovation drivers, with these technologies changes, especially cloud based solutions, we can expect to have faster services in the market in form of proof of concept, where different actors (collaborating) share the initial investment and risks. This together with the possibility to offer business models as 'pay as you grow', models that minimize the investment risk of the customer and that can adapt to a future grow, will be also one of the drivers of collaboration scenarios.
- As pointed in the Innovation Capabilities section in Chapter 2 and motivated by the changes in the industry, we have to expect the need to deal with the three challenges pointed, namely business, technology and social. Note the first two were explicitly mention in the interviews as collaboration drivers. It is important to mention that also social innovation as knowledge networks will be become more relevant, because of the specialization and industry cross boundaries collaborations required.

	Past	Actual	Upcoming
Technology	Hardware based solutions predominant. Closed ecosystems	Software based solutions predominant. Open interfaces relevance Many ICT technologies are wide accepted and deployed in Telecom solutions	Software based solutions and access network extension: NVF[38], SDN, e-SIM, Cloud/OpenStack Wi-Fi access technology Narrowband IoT, LPWan, LoRa/LoRaWan
Market	Closed on vendor side (big corporations) and operator side (state owned) Big vendors have a strong position and delivering closed systems bounds customers to vendors. Long time to market cycles.	Strong regulated promoting competition. Strong position of operators. Open interfaces allow vendors mix. Shorter Time to market and commoditization of services push the prices down. Additional sources of revenue needed.	Pan-European operators Global operators. Access network for specific needs (IoT) New access technologies and convergence of IT and Telecommunication will change the landscape in terms of actors, services and business models. Pay as you grow and 'free')
Actors	Equipment vendors, network operators, service providers.	Additionally, navigation and middleware providers, application and content providers.	Additionally, other industries (transversally) newcomers.
Collaboration	Rare, insourcing Insourcing If existing, very closed.	More common, driven by time to market and specialization (Especially on SME'S) and risk minimization.	Technical solutions will be designed inherently to work as component that could be easily integrated with external solutions. Faster time to markets will push to have a direct way of closing collaboration deals minimizing human interaction and defining standards and technologies to support these agreements.

Table 6 .- Summary collaboration changes (Source: Author)

4.3   Areas of improvement

Out of the interviews feedback there are areas, where improvements would be desired (or at least that have a potential to cope with some of the existing problems of collaboration):

Efficiency

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[38] Network Virtualization Function

http://www.etsi.org/technologies-clusters/technologies/689-network-functions-virtualisation

If we consider the kind of collaboration most common in this domain (R&D centric SME's with certain degree of incumbency), this is often motivated to support the innovation process of improving existing services and functionality already in place. This way we can categorize the kind of innovation as incremental; a continuous improvement process motivated on one side to serve existing customers and in the other to remain competitive keeping up the service and product portfolio with future customer requirements and technological changes. We have to consider that normally bigger innovation steps are necessarily bounded with higher risks due to uncertainty associated, considerable upfront financing requirements and for a collaboration, more complex to establish, manage and standardize. It is in the most common scenario where collaboration improvements can pay off by speeding up the overall process of setting up a collaboration relationship faster (for example in form of new products into the market).

The already mentioned technology changes, cloud deployments plus the shift from component centric solutions to a more functionality product conception can be identified in other industries. As a matter of example, Nuance[39] is a well-known company that provides speech recognition solutions that have been used traditionally in telecommunications systems (but also in healthcare, automatization, consumer devices …). On their website they have published different partners in healthcare industry that use the cloud based speech products to support their solutions[40]. The facility of being able to use the Nuance components over public interfaces should be also complemented with the efficiency of getting a commercial agreement to use them. This is often bounded with a sales process that might take weeks (if not months). Even though this kind of offering is becoming a reality also in specific elements in telecommunications, take for example the Cloud based Mobile Gateway offered by Nokia[41], that when it

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[39] https://www.nuance.com/index.html

[40] https://www.nuance.com/healthcare/medical-transcription/cloud-based-healthcare-technologies.html

[41] https://networks.nokia.com/products/mobile-gateway

comes to purchase the product, it redirects to a formulary[42] where you will be called back … in a way, back to the traditional sales channels.

Market changes

Changes in the market of telecommunications are expected to have major impact in existing areas in the industry. For example, the roll out of e-SIMs is expected to be a "game changer" in mobile telecommunications. From the end customer perspective, it implies more than the physical removal of the SIMs as we know it. It is supposed to bring more freedom to choose operator and device connectivity. On the network side, the introduction of build-in chips to replace the physical SIMs will redefine the control distribution of existing stakeholders. Even though three[43] main stakeholders are involved in this specific aspect to make make the mobile communications possible, the administration and control is currently clearly located on the Operator side. This is only a small example of the upcoming changes and the consequences they might have.

One of the major game changer identified in the interviews is the the general roll out of IoT/M2M as people's everyday life. The main challenge (and opportunity) is to create value for business and individuals. The change in the different industries due to the emergence of new stakeholders associated to the IoT value chain (and value networks) will have an impact in the existing markets as we know them today. Due to the fact of telecoms owning the devices global connectivity, there is not doubt that this industry will be directly involved in this revolution.

"Although IoT is a promising spot in the rapidly maturing mobile industry – as testified by a thriving connectivity market in which Vodafone continues to lead the pack of players vying for global supremacy in terms of SIM cards, followed by AT&T, Deutsche Telekom and Telefonica (according to Machina Research[17]) – operators seem not able to realize its full potential without strategic partnering and business model shifts".
Unify IoT EU. (IoT Business Frameworks)

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[42] https://networks.nokia.com/how-to-buy

[43] Mobile Operators, SIM Vendors and Mobile devices OEM's.

The question is, how much and in what manner. There are basically two scenarios for mobile operators, either to provide the plain connectivity acting as a 'wire' and stand back, or get into the game of adding more value providing E2E solution that might be tight with higher risks, but definitely with better opportunities to develop the industry. This later option is subject to the development of new competencies and the redefinition of relations among existing and new stakeholders, but also with the market fragmentation due to the existing lack of strong standards as it does in the existing telecommunications industry. The different dimensions of the opportunities offered by IoT/M2M can be driven both in a vertical as well as an horizontal integration. In case of a vertical integration trying to gain stronghold in different stages of the value chain. In an horizontal integration in the pursuit of economies of scale and scope. As a matter of example and referring to the study of Nokia about IoT business we can see the spectrum and expectations (timewise and potential wise) of different industries.

Figure 12 .- IoT Horizontal spectrum (Source:Nokia[44])

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[44]https://networks.nokia.com/sites/default/files/document/9_let_s_talk_-_internet_of_things_operator_strategies.pdf

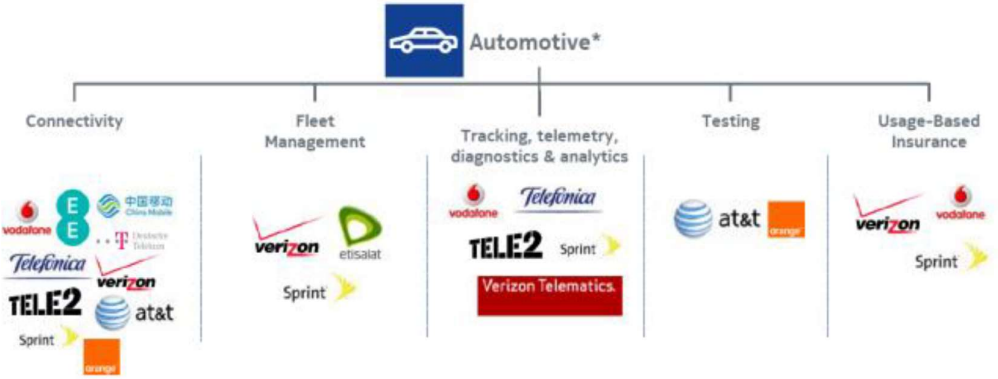Looking deeper the opportunities in the Automotive industry offers to existing operators a reality already.

Figure 13 .- IoT Horizontal diversification (Source: Unify IoT EU[45])

Under these circumstances, highly dynamic environment, new stakeholders transversal to the industry, one of the challenges will be to evaluate possible collaborations. In order to evaluate these scenarios, collaboration options and synergies, mechanisms like value networks as introduced in the former chapter will become more relevant. Cross industry boundaries value networks will be valid mechanism on the one side to redefine strategies, but also partnerships and identify business opportunities. To elaborate new value propositions and go beyond the plain connectivity services, we can see already global players in the industry to have their own programs in form of incubators, startup supports and the like to test new markets identify synergies and redefine their future strategy.

Operator	Web	Geographical Area
Telefonica	https://www.openfuture.org/en/spaces/wayra	Hub of 10 Countries in Europe and LATAM.

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[45] http://www.unify-iot.eu/

A1	https://www.a1startup.net/	Austria
Deutsche Telekom & Nokia	https://www.hubraum.com/	Germany

The relevancy of frameworks like the value network are valid mechanism to understand the changing and complex emerging environment in a holistic way. This seems to be a new area of interest where business developers will have the possibility to gather interdisciplinary actors to create a higher value.

5   Closing

> "Now this is not the end.
> It is not even the beginning of the end.
> But it is, perhaps, the end of the beginning."
> *-Winston Churchill*

The objective of this thesis is to offer a better understanding of what are the relevant criteria to choose the right collaboration option for the innovation strategy contextualized in the telecommunication industry, to point out areas that are likely to change and are expected to be relevant for the collaboration strategy definition in the upcoming years. To articulate this research topic, we have initially defined a main research question complemented with two sub questions to structure the paper. We have to be however aware of the limitations of this thesis. First, limitations of the explorative approach valid only to identify further areas of research and better understanding of the research topic. Second, the limited case approach. No matter how successful and experienced the participants of this research are, the telecommunications industry is vast, the amount of actors are numerous, so the perspectives and perceptions. Probably adding other kind of participants having a extend B2C experience in the industry, especially MNO's and MVNO's would have brought other collaboration insights, other kind of collaboration options closer to user innovation and other variants of open innovation. These additional cases are left to be analyzed in a further research.

Being aware of the limitations, I would like to finish this final section of the thesis trying to look to the future pointing out further areas of research that should be relevant to later studies in the area of collaboration.

Industry changes

Telecommunications sector is under pressure. The traditional services offer is becoming more and more a commodity. One of the major challenges of operators is finding new sources of revenues. In addition, the convergence between this industry and the content provider and software industry is evident. The boundaries between information technology and telecommunications have become almost indistinguishable. This rapid convergence is happening in different technological levels. Cloud deployment hosts equally IT solutions and telecom systems. The usage of common hardware and operating systems together with the introduction of virtualization stacks has enabled this convergence. In addition, the pipeline infrastructure converges in all IP connectivity. Probably the last remaining bastion in this convergence is the access network, still exclusively in the hands of mobile operators. However, even here we can already identify technology developments that might radically change the industry's landscape. Access technologies like Wi-Fi calling are becoming a reality. The entry barriers for new firms that provide access network solutions are in this case much lower than the traditional radio access network currently in place.

This new scenario will promote other forms of collaboration in the telecommunication industry. In addition, in terms of services, it will be possible to seamlessly access and provide services that do currently not exist in the mobile service offering. Think about asking Alexa[46] not to be disturbed in the next hour on the phone, unless your boss is calling.

In addition, the introduction of new business models currently not known in telecom will appear. For example, how to compete with 'free'. Can you think about Gmobile, a new mobile operator where calls are free as long as you allow your conversations to be processed for commercial usage … As weird

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[46] https://en.wikipedia.org/wiki/Amazon_Alexa

as it might sound, this is a reality since 2004 for mails in the biggest mail provider worldwide. Furthermore, accurate real time speech processing technologies are already available.

This convergence is an ongoing process and in many areas of the industry a reality. A major change expected is the development and spread of the Internet of Things as a common feature in our lives. This change is going to have major influences in different well established industries: automotive, electronics, energy, facilities, manufacturing, retail to name a few. Telecommunications will necessarily be one of them. These changes will generate additional needs (read new markets) that represents ultimately new business and innovation opportunities. The need of further security options is a good example for the existing telecommunications industry to provide something else than a "dummy pipe". To provide this value added services we have to be ready to have collaboration among firms that in the past was unthinkable because of the domain distance. What has Ikea with Lego[47] to do or Volkswagen with the Deutsche Telecom[48]? This kind of collaboration are becoming common, trend raising. To have an understanding of the different industries, value chain, product life cycles, and business models will require not only flexibility in different areas within every single organization, but also in the way collaboration actually works. In the same way Internet has revolutionized many things in our daily lives, IoT is the missing glue that will enable this revolution in a much wider level where persons won't be necessarily be involved.

The options (not just for collaborating) are vast, so the challenges!

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[47] https://www.lego.com/en-au/aboutus/news-room/2018/june/ikea-and-lego-group

[48] https://www.telekom.com/en/company/details/deutsche-telekom-s-smart-home-app-soon-to-be-available-in-volkswagen-vehicles-489354

Technology for collaboration

> *[IG]* *".. the overhead, the effort, the inefficiency of human collaboration is no longer something people will longer pay for."*

> *[MS]* *"We would not have started this business without knowing him and have worked together before."*

If I had to name three things that all the interviewed mention relevant for collaboration these would be Trust, Trust, and Trust. This is probably another topic for a thesis "trust in business". Fact is that analyzing potential partners to collaborate with, defining a strategy and finding a good fit for a long-term relationship is something that could be done in a structured way; however, it is complicated to deal with trust. Trust is a very human dependent factor biased and bound with uncertainty. However, based on the participant's experience, it plays especially a relevant role when it comes to collaboration. The thesis held in this paper defends the increase of collaborations, number of participants and longer 'distance' involved (meaning industries that traditionally have not much in common). Here we see one of the areas where we can expect more changes in the upcoming years. Despite of the number of platforms and services developed to enable collaboration between teams, the standardization of API's integrations over well-defined interfaces and suitable architectures (e.g. micro services), it is still missing a valid technological support that could improve (replace at some extend) this human interaction aspect in the collaboration.

It is adventurous to make predictions related to technologies, its applications and market acceptance. However, the momentum of technologies like block-chain, that allow to build up trust in a distributed network together with applications like smart contracts is starting to be a reality. These kind of applications should be suitable to formalize many of these collaboration exchanges and reduce the overhead of human interactions. There are still important aspects to clarify before these technologies can be really used.

To name a few, the exiting smart contracts implementations have architectural limitations: they run sequentially, all node executes all smart contracts, consensus protocols are hard-coded, the trust model is static and not flexible, and non-determinism in smart-contract execution poses serious problems (Vukolić, M., 2017). Also the public character of the existing block-chain might be a 'no go' in B2B transactions where confidentiality together with trust are essential. For this, there are already universities and big corporations working to solve these problems, like the introduction of permissioned block chains. This area of research is very promising, worth a thesis on collaboration and smart contracts.

Annexes

Annex A - Collaboration by Teece

There are other classification found in the literature while analyzing strategic alliance between firms (inter firms cooperation[49]) especially in high technology industries that are dealing in rapid innovation environment and wide geographical dispersion of expertise. As a matter of completeness and because we find a relevant classification, we have decided to introduce this classification in this first annex.

As described by (Teece 1990) the strategic alliances appears to be a hybrid structure well suited to today's global realities in industries experiencing rapid technological change. These industries required <u>operation</u> and <u>strategic</u> coordination. These inter firm alliance facilitate reciprocal specialization among different firms (Teece 1990), such as when one specialized providing technology equipment in form of OEM and other commercializes and integrates to the end customer needs having the selling channels and operational resources to do that.

Teece's collaboration taxonomy is also based on a governance dimension, however using different subdivisions as Pisano and Vergati use it. In this case the governance organigram topology is considered but whether the governance is equity based or not, a more strategic centric dimension.

In the case of non-equity collaboration relations, a time based dimension is introduced, defining an exchange for a short-medium cash based collaboration. At the same time, alliances are bounded with a longer-term

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[49] Open innovation is a recent expression that it was introduced by Henry Chesbrough in this book *Open Innovation: The new imperative for creating and profiting from technology (2003)*. However the benefits and driving forces behind increased openness have been noted and discussed as far back as the 1960s, especially as it pertains to interfirm cooperation in R&D.

perspective; therefore, this kind of collaboration is more suitable in case of strategy alignment between the parties is required.

	Nonequity	Equity
Exchange	short-medium term cash-based contracts	passive stock holdings for porfolio diversificaiton
Alliance	mid-long-term bilateral contracts (non-cash based), non-operating joint ventures and consortia	operating joint ventures and consortia, minority equity holdings, and cross-holdings

| **Cartel** | price fixing and/or output restricted agreements | |

Figure 14 .- Taxonomy of interfirm arrangements. Teece 1990.

For the equity based collaboration the time dimension is not so relevant, but the purpose of this collaboration. This way, an equity-based exchange has primarily a financial motivation, typically used as stock holding for portfolio diversification. On the other side, an equity-based alliance has a stronger strategy meaning and is the basis to form consortia, joint ventures or equity holdings. This option is the one that in terms of governance and strategy alignment offers the better options.

In the classification introduced by Teece, there is a final collaboration type that do not really fit in the dimensions used so far, and could be considered as a singularity. This is the **cartel** modality (also known as exclusivity relationship). Historically this kind of collaboration has pursued to maintain prices at a high level and restrict competition.

Even though this kind of collaboration is normally contra productive for the end customer and is not the best in order to promote innovation, could be a valid strategy in specific market constellation to defend positions of SME's against bigger players.

Annex B - Questions Catalog

Section 1 .- Activity and context

   Introduction of the interviewed experience.

Section 2 .- Experience on this area not available

   (The firm/person has not experience on collaboration.) Note however there might be firms that have done some kind of collaboration in one areas (e.g. business development outsourcing) but not in others (R&D)

- Do you (firm/person) plan to collaborate in the next future?
- What are the reason the firm hasn't been collaborating so far?
- What are the criteria that should be fulfilled in order to make a collaboration happening?
- What are the major benefits expected collaborating?
- Do you see any entry barriers for collaborating?
- Do you see any threads for collaborating?

Section 3 .- Collaboration experience on this area is available

- Can you explain the areas the company you have worked for has been collaborating with?
- Can you explain the reasons why the firm decided to collaborate?
- How would you define the experience of collaborating?
    - Good and bad experience?
- What would you do different?
- What was the acceptance of collaboration within the firm?
- Do you plan to continue collaborating with external firms?
- How did the specific way of collaborating cater the defined goals
- In your opinion, where do you see improvement aspect in this topic and future changes on handling collaboration?

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