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**Industry boundaries in times of change:
how do firms strategize?**

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Abstract

We are interested in markets which are being restructured or about to be created, as a result of the co-evolution of technologies and market dynamics. A systemic analysis of competition alternatives among groups of firms seems more accurate in order to understand the impact of different dynamics at the early stage of market restructuring. We observe that firms operating in a high environmental uncertainty and blurring industry boundaries collaborate rather than compete (Gual, 2004) for shaping the foundation of market characteristics and to capture future rents appropriation.

The focus of the paper is about the evolution and the redrawing of market boundaries among actors in a highly regulated environment. Specifically, we address the relationship between mobile operators and mobile manufacturers, and the different innovations related to the fixed / mobile convergence. We distinguish two phases, a phase one from vertical integration to disintegration (influence of regulation) and a phase two from disintegration to the early re-integration process (influences of market forces and the co-evolution of technologies). Our focus will be on the second phase and the mobile-fixed interface. Specifically we are interested how firms strategize *vis-à-vis* one another in shaping the foundation of new market characteristics by altering current industry boundaries.

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1. INTRODUCTION

The European telecommunications industry's restructuring is mainly due to the convergence among the telecommunications, the media, and the computer industries. Currently, the growth in specific market segments of the INFOCOM (the information and communications industry) has affected each existing industry structure. New dynamics and relationships among actors have modified respective value chains. At the same time, three underlying industrial structural forces namely, regulation, technology, and market dynamics, have altered the European telecommunications industry. The industry's deregulation was aimed at designing efficient markets through the introduction of competition among firms (Flacher & Jennequin, 2005), as well as implementing new incentives to entrants and the break-up of the incumbents' monopolies through progressive markets liberalization over time (i.e., markets for terminal equipment, value added services, mobile telephony, voice telephony and public network provision).

This paper investigates the early vertical re-integration process among specific layers since the European telecommunications deregulation. We attribute the early vertical re-integration in the European telecommunications industry as being the result of the co-evolution of technologies, regulation, and market dynamics. We emphasize on the effects of these changes occurring at the downstream and the upstream, between and within segmented layers of the industry value chain as the outcome of the evolving interactions among actors from different market segments, based more on long-term collaborative arrangements and history dependency. This paper aims at understanding the restructuring process during the 'organization of the industry' (Richardson, 1972) and to assess the factors influencing the redesign of the industry boundaries from actors in a highly regulated environment. Our paper present three main studies and focuses on the mechanisms and firms' actions in shaping the evolution of an industry structure (Jacobides & Winter, 2005; Brühl & Stieglitz, 2005; Cacciatori & Jacobides, 2005).

The paper is structured as follows. The first part reviews the literature about firms' strategies in redrawing industry boundaries in a dynamic environment. The second part introduces the context and the key players in the European telecommunications industry. We distinguish two phases during the industry transition, a phase one from vertical integration to disintegration (influence of regulation) and a phase two from disintegration to re-integration (influences of market forces and co-evolution of technologies). The third part focuses on the second phase and the mobile-fixed interface. Specifically, our analysis will be about how firms strategize *vis-à-vis* one another in shaping new market characteristics.

2. FIRMS' STRATEGIES IN REDRAWING INDUSTRY BOUNDARIES IN A DYNAMIC ENVIRONMENT

In strategic management literature, the purpose of delineating the industry boundaries is to assess the nature of competition, to position different firms, to analyze the industry profitability and its attractiveness (Porter, 1980), to understand sectors dynamics and to monitor the macroeconomic environment such as the Political, Economic, Social and Technological factors (PEST framework).

Therefore, the delineation of the industry boundaries serves to determine firms' strategies. In this perspective, industries are classified based on a selected unit of analysis such as groups of firms, sectors of activities, actors, products classification, high versus low tech industries, technological systems, factor intensities or industrial performances (Peneder, 2003).

However, this traditional industry perspective with such a well defined market structure seems insufficient, if not inappropriate, in markets being restructured or about to be created, as the result of the co-evolution of technologies and market dynamics, within an industry in transformation (Sampler, 1998; Munir & Philips, 2002). A converging market (Jacobides & Winter, 2005) is a concrete illustration. In this case, the industry boundaries render difficult to identify the relevant actors, and adequately categorize product offerings (Munir & Philips, 2002). Thus, the study of an industry boundaries remains still incomplete because of a lack of understanding about the factors leading to the vertical integration, disintegration and more particularly the emergence of the vertical re-integration process at the industry level (Jacobides & Winter, 2005; Brühl & Stieglitz, 2005; Cacciatori & Jacobides, 2005). This omission leads towards a misconception of competition between inter and intra sectors, the effects of groups firms' strategies during the early stage of market restructuring and the shift in the value of resources over time among actors within an integrated technological system (Adner & Zemsky, 2002). Indeed, the evolutionary mechanisms of an industry, at the aggregate level, is an important aspect of the overall sectors dynamics among markets (Jacobides & Winter, 2005), and at the micro level, why incumbent firms succeed or failed in coping with the effects of technological change.

In the literature, the Transactions Cost Economics research (TCE) has focused on determining the firm's boundaries (Williamson, 1985), by looking at the coordination mechanisms, the types of transactions costs and the various effects between the market and the individual firm. Thus, TCE distinguishes the tasks performed within the firm from the ones in the market, which factors affect the individual firm's choice and the type of governance structures. From this perspective, the firm's boundaries are assessed either by looking at the firm's vertical boundaries (buy or make) or at the firm's horizontal boundaries (i.e., the size and the scope influencing a market structure, the market power of different actors, the degree of entry barriers and the cost per unit of a product). Generally, the firm's horizontal boundaries (i.e., the scale and the scope of activities are used as the firm's boundaries) have been explained as a firms' specialization in a stable (Bruisoni et al., 2001) and unstable environment (Afuah, 2001). However, few studies address the effects of firms' strategies in redrawing industry boundaries in a dynamic environment (Adner & Zemsky, 2002, Gatignon & Soberman, 2001).

This paper departs from transaction cost theory (the focus is about contractual versus non contractual) and agency theory (the focus is about the ownership of assets). These streams of research do not assess the positive effects of innovation practices in the firm's performance in a highly regulated industry (Krafft, 2003). Long-term collaborative arrangements are not always assessed in the incumbent firm's product offerings (Gulati et al, 2005). Therefore, further explanations are needed in assessing issues such as the co-evolution of firm's capabilities over time (Jacobides & Winter, 2005), the strategic partners' resources during the incumbent firm's production process (Gulati et al., 2005; Gomes-Casseres, 2005; Krafft, 2003) and the collaboration / competition among firms known as 'co-opetition' (Nalebluff & Brandenburger, 1995). This is mainly because the effects of firm's vertical integration and its impact on the industry structure are an under-researched area in industry analysis literature (Brühl & Stieglitz, 2005).

Our approach in this paper stems from a better understanding of firms' strategies in redrawing industry boundaries through the effects of collaborative arrangements between firms across the various 'industry layers'. The specificity of the telecommunications sector (Kraftt, 2003; Fransman, 2002; Li & Whalley, 2002) is characterized by the existence of complementary assets (Teece, 1986), the interoperability among telecommunications infrastructure networks, the use of common standards and network effects. Few studies looked at the effects of vertical disintegration of a sector and its impact at the industry structure (Brühl & Stieglitz, 2005), the reasons why certain industries re-integrate (Cacciatori & Jacobides, 2005) or disintegrate through the firm's capabilities over time (Jacobides & Winter, 2005). In this line of studies, we believe that the question of how firms strategize, as a result of the shrinking, enlargement or convergence of current industry boundaries in times of change may deepen further our knowledge about the constant interactions between the firm's micro and macro environment. Specifically, the dynamics process and the causes occurring during different phases: vertical integration, disintegration and re-integration and the changing relationships at intra and inter sectors competition / collaboration within an industry.

The first part of this paper is structured as follow: first, we will introduce the context; secondly, we will introduce the shift of market boundaries and the effects of technological change on firm's capabilities. Thirdly, we will present an overview of the causes of vertical integration, disintegration and reintegration of an industry in the current literature.

2.1 The context

The impact of technological change, such as the one stemming from information technology, is occurring at two levels: at the firm's production and at the organizational levels. On the one hand, increased specialization has lead to a closer collaboration among the incumbent firms and their strategic partners and to a more integrated supply side (Quinn, 2000). Firms' collaboration and their value chains' integration have been further compounded by the diffusion of the information technology. On the other hand, the incumbent firms are faced with new dynamics on the demand side. The market has become more complex, as different consumers and other stakeholders such as regulators can directly access information from publicly available sources and demand changes.

According to Arthur (1998), the organizational adaptation occurs at two levels: (a) internally, through a better management and coordination of internal resources and (b) externally, through the leverage and the management of inter-firm resources under long-term collaborative arrangements. In dynamic markets, some incumbent firms create competitive advantage by combining their internal resources and the use of complementary assets. Technological change brings new challenges, opportunities and threats in the balance of power among various stakeholders. Hence, the firm's performance and the process of value creation are becoming more dependent upon strategic partners' participation over time (Ritter & Gemünden, 2003).

The increased collaboration among the incumbent firm and its network of strategic partners has encouraged the division of labor and the specialization among firms. As a result, some incumbent firms tend to leverage each other complementary assets and core capabilities. Thus, over time, the incumbent firm and its strategic partners tend to realize a portfolio of cross-disciplinary 'core competences' (Prahalad & Hamel, 1990). A 'networked organization' structure emerged among firms by means of long-term collaborative arrangements. These contractual agreements include joint-

ventures with equity stakes, research consortium, or loose partnerships with shared objectives. In this specific context, the incumbent firm's competitiveness stems from the mobilization of the strategic partners' complementary assets. Thus, the evolution of the incumbent firm as a networked organization and its ability to leverage the resources of its strategic partners, is posing new challenges to current theories of the firm and more particularly to the Resource Based View of the firm (Matthews, 2003).

Hence, the value creation process occurs outside the incumbent firm's traditional organizational boundaries (Zott & Amit, 2002). The incumbent firm sustains a few core capabilities through the leveraging of key strategic partners' complementary resources. As a result, the incumbent firm becomes embedded in several networks of firms. Each firm specializes and leverages each other partners' shared capabilities in order to sustain the long-term sustainability of the common 'network capabilities' (i.e., the common pools of resources among a group of firms via the traditional market mechanisms as a result of long-term collaborative arrangements). The realization of economies of scale is beneficial for the incumbent firm, as well as for its strategic partners. However, in a dynamic environment, the effects of technological change pose new challenges and issues among the groups of firms and their contribution to the long-term sustainability of the common network capabilities.

Hence, the process leading to the market emergence of competition / collaboration is not properly understood in markets characterized by network externalities. In such a market, the compatibility of complementary technological assets (Teece, 1986) contributes to improve current technologies. In the Resource Based View of the firm (RBV), the future development of capabilities depends on several types of factors such as the timing of market entry in cases such as: the radio industry (Klepper and Simons, 2000), the semiconductor industry (Hoolbrook et al., 2000); the customers' influences during the firm's investment decision process (Helfat and Rautbistschek, 2000), the organizational learning (Winter, 2000, 2003) and the management of dynamic capabilities (i.e., the ability to manage organizational capabilities in a changing environment) (Teece et al., 1997).

Indeed, the early stage of competition in a market with network externalities, such as the telecommunications industry, is about the future rents appropriation of a potential growth market. The competition in such an industry (Koski and Krestchmer, 2004) differs from others industries because of the need for collaboration and compatibility at the early stage of the technology diffusion (Arthur, 1989). Therefore, in order to decrease the level of uncertainty, the innovative firm should ensure that the new technology specifications match the firm's current capabilities and knowledge based competences (Anderson & Tushman, 1986). Thus, the pre-early market emergence is based more on collaboration among actors (Moore, 1993), the aim is to develop and to coordinate the production of compatible products. The pre-early phase of market dominance is coordinated among a group of firms; each participating firm contributes to shape the future industry characteristics within the common 'ecosystem'. Thus, competing ecosystems occur during an industry restructuring or during the emergence of a market (Tushman & Rosenkopf, 1992).

In this perspective, 'collective competition' (Gomes-Casseres, 2005) or 'system competition' (Shapiro & Varian, 1999) is neither about competition firm to firm or firms against other firms. This concept is about how strategic alliances impact the organization of an industry among *groups of firms* (Gomes-Casseres, 2004). 'Collective competition' is defined as *groups of allied firms against other groups instead of the traditional battle firm versus firm* (Gomes-Casseres, 2005, Chap 2.3: 13). These forms of collaboration lead towards new relationships among firms and new tensions among partners in term

of governance, rent and power within the ‘constellation’ (Zott & Amit, 2002). The focus is on the interaction between competition and cooperation (Gomes-Casseres 2005, 2003). The author argues that competition in constellations is about focusing on three main aspects – the strategy, the governance and the dynamics. In this case, a group of actors is unified as a result of the division of labour and their specialization in offering complementary assets and competencies to the ‘ecosystem’. The study is about the extended value chain and the coordination mechanism of the integrated intangible network at the industry level. Few studies have looked at the impact of firm’s partnering decision in times of change (Gulati et Al., 2005) and how it may affect the industry boundaries. In high technology markets, firms developed a high dependence of complementary assets (Teece, 1986) in their final products, the embeddedness within a technological system results in firm’s specialization in a specific competence area within the network.

This view of competition has been addressed in strategic network theory. There are three main aspects: (1) the structure, (2) the content, and (3) the governance of firms (Zott & Amit, 2002).

This literature looks at answering three main questions: (a) why does a network of firms exit?, (b) Why does a network of firms differ in terms of size and scope of activities? and (c) why does a network of firms perform better than others?

Strategic network theory considers the incumbent firm’s cooperative arrangements as a resource (Gulati et al, 2000). This stream of literature addresses how pools of firms share resources and capabilities outside their own organization’s boundaries, in order to sustain their competitive advantage (Gulati et al, 2000). In this perspective, resources are not acquired through competitive market mechanisms, but through mutual contractual arrangements between the incumbent firm and its strategic partners. Thus, this theory looks at how a firm leverage and share resources outside the organization boundaries via the network of partners (Gulati *et al.*, 2000; Gulati et al., 2005). The network contributes to the firm’s competitive advantage. Specific issues are addressed in the literature such as:

- (1) the characteristics of the network and the different classifications of network forms (Cravens et al, 1996);
- (2) the design structure of a network through the study of transaction exchanges between firms and their relationships (Zott & Amit, 2002);
- (3) the hierarchy among firms within the network, i.e., how the centrality within the network enables specific firms to extract rents from the network by letting other partners to access a shared resources;
- and (4) the knowledge between firms (Kogut, 2000).

2.2 The shift of market boundaries and the effects of technological change on firm’s capabilities

The literature about the incumbent firm and the effects of technological change focuses on the devastative consequences of the new technology on the incumbent’s main core capabilities. These approaches focused on the effects of technological change on an industry structure from the entrants’ strategies; nevertheless, little research addresses the incumbent firm’s response (Hill & Rothaermel, 2003) and the ‘dynamics of strategy’ over time (Adner & Zemsky, 2002).

Indeed, technological change is characterized by a progressive diffusion across markets (Gilbert, 2003) and has an endogenous element (Gatignon & Soberman, 2002, p.23) triggered by actors (firms, regulators, customers, suppliers, lobbying firms) within a technological system. Thus, management of innovation studies address one specific period of the technological change diffusion and its effects on the existing industry structure. Therefore, other parameters are not fully addressed such as the social, regulatory and the firms' interactions in shaping their environment (Tushman & Rosenkopf, 1992). Thus, most of the current studies do not assess properly the sources of the 'pre-infant' phase of technological change. This is because current studies consider technological change as an exogenous and uncontrolled variable.

Within the management of innovation theory, there are two streams of research focusing on the effects of technological change on a firm's capabilities.

The first stream of research focuses on the causes of incumbent firm's adaptation to technological change. Three alternative approaches derive from this first broad stream of research:

- The first approach looks at the following aspects: the introduction of the effects of the technology on the industry structure (Anderson & Tushman, 1986; Henderson & Clark, 1990); the diffusion of a technological innovation over the product life cycle (Utterback & Abernathy, 1975) and the performance assessment of the new technology with the 'S curve model' (Foster, 1986).
- The second approach look at the organizational capabilities and the reasons of 'structural inertia' within a large organization (Nelson & Winter, 1982); the entry timing and the investment decisions between entrants and incumbent firms in a particular subfields (Mitchell, 1989).
- The third view approach refers to the firms' position within a system; i.e., the 'value network' (Christensen & Rosenbloom, 1995).

The second stream of research focuses on the impact of technological change and the broader firm's environment, to what extent key partner's capabilities (i.e., co-opetitors such as suppliers, customers, complementors, and alliance partners) may be affected by the effects of technological change and impact negatively the incumbent firm's performance (Afuah, 1995, 2000). The 'innovation hypercurve' model (Afuah & Bahram, 1995) provides the multi-facets of an innovation, under which an innovation can impact differently actors located at the upstream and the downstream value chain. The model highlights the inter-firm linkages dependence.

Overall, little attention is devoted to the pre-early stage of market competition. Specifically, how a group of firms within a technological system can shape or mould the future industry conditions (i.e., the sources of technological change and the firms' strategies to shape the future characteristics of an industry). In this context, there are different categories of competition among actors and hierarchies within a technological system over time.

The evolution of competition over time has different implications for the assessment of the industry boundaries and the firms' strategic behaviors. Barney (1986) distinguishes an integrated framework among the typologies of competition in microeconomics literature (1) the Industrial organization perspective of competition, (2) the Chamberlinian competition and (3) the Schumpeterian competition. Therefore, competition has multiple facets during the industry evolution; from the birth, the development and the decline or the rejuvenation of an industry (Porter, 1980), during the technological innovation life cycle over time (Abernathy & Utterback, 1975).

In strategy literature, Porter's five forces framework (Porter, 1980) is about the firm's position and the interactions of underlying drivers within an industry. In this framework, the firm's microeconomic environment and the interactions of different actors such as competitors, entrants, substitutes and suppliers lead towards the firm's profitability in a given industry. From this perspective, the 'structural analysis' of a particular industry (Porter, 1980) is addressed during a stable environment. However, the traditional view is inadequate in an environment with high uncertainty (Li & Walley, 2002; Slater & Olson, 2002). This is specifically the case in industries characterized by network externalities, technological change and the implementation of a regulatory process, in which the industry structure is affected by a continuous process of change; namely, new dynamics, globalization, technological advances, deregulation of industries and the information technologies (Slater & Olson, 2002). The authors argue that unpredictable factors such as customers' demand should be considered during the assessment of the industry's profitability.

Jaworski et al. (2000) distinguish also two streams of research with regard to the concept of market orientation:

(1) a 'market driven' is about '*learning, understanding, and responding to stakeholder perceptions and behaviors within a given market structure*'. This perspective implies an understanding of a well defined market and firms serving existing customers.

Whereas (2) a 'driving market' is referred as '*changing the composition and/or roles of players in a market and/or the behaviours of players in the market*' (p: 47: 25). This second stream of research implies the firm's ability to modify the current market structure according to its capabilities. The market-driven perspective contains three main approaches. The firm has the ability to shape the market structure by either modifying the value chain or by introducing new functions, new players or new business models. There are three approaches (1) the constructionist approach; (2) the deconstructionist approach, (3) the functional modification.

1. The constructionist approach relates to the introduction of additional players through (a) the introduction of new players by forming business relationships with the common sharing of proprietary or compatible technologies (b) a deeper business relationships with other firms offering complementary assets.
2. The deconstruction approach aims to affect the market structure by modifying the industry value chain. The strategic firm's intent is to introduce new actors (i.e., wholesalers, distributors and complementors) along the value chain in order to increase the effectiveness of the supply side. The increase customer's value is provided through:
 - The opening of a new channel of distribution and the implementation of a new business model through the elimination of players at the downstream of the value chain;
 - The introduction of process innovation leads to a decrease in the final cost per unit produced;
 - The decrease in the numbers of competitors in the market is achieved through mergers and acquisitions, joint-ventures, partnerships, takeovers;
 - The backward integration along the value chain enables a firm to compete with suppliers.
3. The functional modification is about changing functions of players. The focal firm integrates a forward or backward integration through the control of specific aspects along the value chain either alone or with others firm's strategic partners. From these three approaches, the focal firm can decide either to shape:

- The market behaviour directly by means of (a) proposing a new method / process to customers in doing something; (b) allowing the customers to access directly information; (c) imposing constraints to competitors through lobbying institutions in order to regulate or deregulate a specific market or to reach a near monopoly position in a specific market.
- To shape the market indirectly by means of (a) creating new customer preferences and affecting the product offerings available in the market and thus changing the customers' demand; (b) letting the customers discover new products functionalities.

Even though, this perspective of market orientation has been applied to the business unit of the firm. This perspective provides insights about firms' strategic behaviors in influencing directly or indirectly the future market characteristics (Jaworski et al., 2000).

McGahan (2004) argues that firms should assess the evolution of their industry path in order to select effective strategies. The author distinguishes four industry trajectories: radical, progressive, creative and intermediating. Each phase may impact either the industry's core activities or core assets. Hence, the categorization of different types of industry structures is explained in relation with the types of changes.

1. The impact of radical changes of an industry trajectory tends to affect progressively both core assets and core activities of the industry structure. These changes result from changes such as a new technology in the market or the deregulation of monopolistic industries (Telecommunications, Energy, Water, Post, Airlines). These changes modify the market mechanisms of the industry by reconfiguring existing relationships among actors.
2. An intermediating change of an industry trajectory occurs when core activities of an industry are threatened by the emergence of substitutes. These changes modify the relationship at the upstream and the downstream of the value chain and substitute channels of distribution encourage the implementation of new business models in the industry. Generally, these changes are difficult to perceive because specific aspects of the value chain are modified without affecting the entire industry.
3. A creative change of an industry trajectory impacts the core assets of the industry. However, the relationship between customers and suppliers remains unchanged.
4. A progressive change of an industry trajectory modifies the core assets and the core activities are not threatened by these incremental changes.

McGahan highlights these four industry trajectories. An alternate model of the industry is presented where two concurrent industry trajectories (i.e., an established and an emerging industry structures) are evolving concurrently over time. In this model, the author distinguishes four phases – emergence, convergence, coexistence and dominance – and the necessity to analyze the evolution of different markets.

Overall, market dynamics studies are reassessing the traditional industry perspective. These studies provide us with an insight regarding markets' evolution, the different industry trajectories related to changes and uncertainty from the broader firm's environment and firms' strategic behaviors and the coordination process among actors in the case of market restructuring.

2.3 Overview of the causes of vertical integration, disintegration and re-integration of an industry

An industry evolution undergoes different stages as the result of the modifications of the industry structure. In this part, we present an overview of the causes leading towards the vertical integration, disintegration and reintegration of an industry structure, presented in the current literature.

- 1. The causes of vertical integration of an industry:** In economic literature, vertical integration leads to an increase of customers' welfare, a standardization of demand whenever the strategic firms' behaviors are low (Krafft, 2003). From this perspective, causes of vertical integration are due to the difficulty in the transfer of knowledge, the need for standardization of information and the decrease of transaction costs, a low appropriation of innovation rents (Brühl & Stieglitz, 2005), the specific assets of the resources and the 'hold-up situation' (Williamson, 1985). The Resource Based View attributes the existence of vertical integration in order to control the knowledge outside the firm (Teece, 1986).
- 2. The causes of vertical disintegration of an industry:** Different factors can lead to the vertical disintegration of the value chain, namely, technological change, the implementation of new business models and a changing market structure (Stern, 1998), '*the technological opportunities, cumulativeness of new knowledge, transferability of knowledge and appropriability conditions of the innovations*' (Brühl & Stieglitz, 2005, p:1).

The authors propose '*a dynamic theory of the vertical boundaries of the firm and its impact on the industry structure*' and strategic firms' responses in a 'deconstruction industry'. The authors argue that '*previous studies have neglected the effects of vertical integration on market structure and industrial dynamics by focusing the analysis on an individual representative firm, therefore fail to capture the wider implications of vertical disintegration*' (p: 3) and "*how an industry's conditions technological change affect deconstruction of the value chain, the selection of business models and the evolution of market structures*' (p.1). Hence, a strategic framework is proposed in order to measure the effects of firm's coordination and strategic behaviors during a period of technological change on the industry structure.

The deconstruction approach (Stern, 1998) reassesses the industry value chain and the factors leading to changes in the vertical disintegration of the value chain and the emergence of new intermediaries, the impact of the information technologies and the collaboration among firms during the innovation process. In this perspective, there are two impacts on the organization of a market among actors with regard to (1) rents appropriation of an innovation; (2) the customers and the suppliers' relationships. These patterns of change have transformed the organization of the industry value chain (Brühl & Stieglitz, 2005) with new business models and coordination mechanisms among firms' partners. Thus, market transition in an industry is a challenge and an opportunity for vertically integrated incumbent firms (Stern, 1998) because of new functions within the value chain and changing dynamics among actors such as (a) the orchestrator (Edelman & Henskel, 1999) and (b) the navigator (Brühl & Stieglitz, 2005).

- 3. The causes of vertical re-integration of an industry:** Cacciatori and Jacobides (2005) present possible explanations about the reasons of a re-integration process in the building industry due to the following reasons: (1) changes in the demand structure, (2) changes in the professions, (3) firms' strategy and positioning, (4) entering into new markets, and (5) the implementation of new processes aiming at leveraging existing firm's capabilities.

Overall, there are different causes of vertical integration, disintegration and reintegration of an industry structure. These changes affect the industry boundaries and some of these factors are endogenous and industry characteristics. This literature provides insights about the causes of these changes within the organization of an industry. The second part of the paper provides an overview of the context and the key players in the European telecommunications industry.

3. THE CONTEXT AND THE KEY PLAYERS IN THE EUROPEAN TELECOMMUNICATIONS INDUSTRY

The liberalization process reflects the changing institutional structure, the context, the evolution and dynamics in European telecommunications markets. In this context, the progressive liberalization of different market segments emerged from an ‘engineered competition’ (Helsink & Wuben, 2003). Thus, the longitudinal study provides us with a good retrospective of firms’ strategic behaviors within the industry. Finally, the re-integration process has several implications for public policies. The industry liberalization was to disintegrate the former monopolistic value chain and to provide incentives to entrants in the industry.

In this paper, we argue that the emergence of the vertical re-integration of the industry is the result of the co-evolution of technologies and market dynamics. Even though, regulation led to the industry partitioning, other specific factors are also industry specific such as the governance structures among groups of firms over time and the co-evolution of technologies. These factors contribute to understand why actors are willing or being forced to re-integrate at different levels of the value chain.

Industry regulation serves to ensure that actors comply with a common set of market rules in order to ensure fair trading and to protect the consumers’ welfare within a defined boundary. As such, the liberalization of the European telecommunication markets is based on economic regulation. The Commission is the regulatory authority in charge of the regulatory framework and the opening of the market competition. This ‘engineered competition’ (Hulsink & Wubben, 2003) was implemented progressively at different stages. The early stage of the market was characterized by an asymmetric regulation. One of the main objectives of such regulatory measures was to provide new entrants with several market-based incentives, to protect the consumer’s welfare and to guarantee *the Universal Service Obligation (USO)* by imposing to the incumbent operator; among other restrictions, the obligation to provide a minimum set of *high quality services at an affordable price* (EC 96 C 281/03). The relationships between the institutional context and the firms’ strategies provide a better understanding about the reasons firms from different layers in the European telecommunications industry have started to re-integrate and are affecting the overall industry structure.

The second part of the paper is structured as follows: the first part introduces the role of institutions in shaping the European telecommunications industry. Each phase represents an evolution of the market restructuring as the result of the liberalization process.

3.1 The role of institutions in shaping the European telecommunications industry

Public institutions have shaped the European telecommunications industry in two ways. First, the liberalization was to open the European telecommunication markets to competition and at the same time, to impose to the incumbent firm, the obligation to provide a minimum level of basic services to the consumers. Secondly, the creation of various research and development programs: the implementation, coordination and the financial commitments towards cooperative research and development programs in the field of communications technologies are concrete illustrations. All in all, the objective of such initiatives was to protect the long term interest of consumers, but most importantly, to sustain the long term competitiveness of the European telecommunications industry and to coordinate the emergence of common specifications among actors in a more integrated market.

The liberalization of the telecommunications industry in Western Europe was part of a long gradual process of the political construction of an integrated European market. First, the Treaty of Rome established the European Community on Economic and Trade issues among Member States. Then, the White Paper on '*completing the internal market*' (COM 35 (85) 310 Final) initiated the early stage towards a common regulatory framework for the European telecommunications sector. Later, the European integration was further accomplished with the final negotiations of the Maastricht Treaty among Member States, with the creation of a single market and the Euro zone. The Maastricht Treaty had further implications for the European telecommunications policy as well as other sectors in network industries – Transport and Energy – among the aim was the development of a Trans-European Networks for Telecommunications (TEN – Telecom). The core objective of such an initiative was to lay down the future foundation for the accomplishment of an integrated market through a harmonized infrastructure across Europe by means of *Pan-European interconnected networks and services* (Chapter XII of the Treaty).

The overall liberalization process and harmonization in the European telecommunications industry contains four gradual phases. Each phase represents a more integrated European market¹ with the emergence of institutions and a common European telecommunications regulatory framework. The management roll-out of the liberalization process of the telecommunications sector in Western Europe represent one of the many steps towards the establishment of a future supranational State: the European Union. We will present four phases of the European telecommunications industry:

- a. Establishing a common harmonization: from 1984 to 1987;
- b. From monopoly to progressive competition: from 1987 to 1998;

¹ There are six levels for the integration of a market. Each level corresponds to a degree of integration between Member States.

Level 1: Preferential Trade Area (To decrease of EC tariffs);

Level 2: Free Trade Area (To eliminate tariffs in an area such as the intra European Free Trade Agreement (The European Free Trade Association (EFTA) in 1960

Level 3: Customs Union (To establish a free trade zone with external tariffs example: EU and Turkey agreement);

Level 4: A single (Common) market (To select a common policies on products and regulation and freedom of movements);

Level 5: Economic and Monetary Union (To adopt a common policies on Economics and single currency);

Level 6: Complete integration (To integrate the Economic, Monetary and political aspects of the market by establishing a Supranational State).
(Source: Wikipedia.com)

- c. The 1998 package and asymmetric regulation: from 1998 to 2002;
- d. The application of competition law in the common regulatory framework since 2003.

3.1.1 Establishing a common harmonization: from 1984 to 1987

Prior to liberalization, the European telecommunications industry was a fragmented market, as most of the other network industries (Energy, post, water and transport). Each of these industries was a public services enterprise, operating under a monopoly market with the objective to provide exclusively public services. Their financial budgets were included in each annual national industrial policy. The creation of common European initiatives aimed at promoting the roll-out of common European activities in the telecommunications industry in Europe. These initiatives were reflected into four main areas (Source: DG information Society, 1999).

- (1) To harmonize the market: the development of common standards was selected over national specifications;
- (2) to promote common European programs;
- (3) to fund under developed part of Europe: the management of European structural funds with common programs;

And (4) to proclaim a common position at the international level: the European Community on telecommunications issues was a step in that direction.

This early phase established the pillars of the liberalization in the European telecommunications markets with a common policy among all Member States. During this phase, the Commission drew the main road map of the liberalization process by breaking-up the telecommunications industry into distinctive markets. The Green Paper on 'the development of the common market for telecommunications services and equipment' (COM (87) 290 final) initiated the public consultative debate about an integrated economic and regulatory European market.

3.1.2 From monopoly to progressive competition: from 1987 to 1998

During this second phase, the gradual liberalization process in the telecommunications markets occurred at the services and infrastructure levels. The focus was to open a previous monopolistic market to competition, to define the rights of new entrants, to access the market and to impose restrictions to the former monopolistic entity. This important document drew upon two main regulatory texts: The White Paper on the Single Market and the EC Treaty Competition rules. There were two types of directives. The first type was about tackling the liberalisation aspect of the market. The second type was about the market harmonization.

The entry of new actors in the different market segments liberalized (i.e., terminal equipment, satellite communications, value added services, mobile telephony, the network infrastructure, the voice telephony) was followed by prices adjustments in order to maintain universal services to consumers (COM (96) 73).

At the international level, the ratification of the GATS (General Agreement on Trade in Services) dealt about trading of services among members of the World Trade Organization. The annex on telecommunications in GATS 1997, defined the principles of 'basic telecommunications services'

(i.e., voice telephone services, data transmission services, mobile transmission services, personal communication systems and so on). This document is important in the telecommunications related to liberalization and deregulation policies of services among WTO members. The article XVIII offered regulatory principles related to licensing, interconnection, radio frequency, numbering, standards, and tariffs. These binding conditions are applied to any countries in the process of liberalization or to provide licenses under these principles. Indeed, an international treaty always prevails over national laws.

3.1.3 The 1998 package and asymmetric regulation: from 1998 to 2002

The 1998 regulatory package developed over a ten year liberalization process of the European telecommunications sector. The main objective was to implement the early stage of the telecoms markets liberalization through the implementation of an asymmetric regulation. This phase defined the rights of the new entrants, imposed restrictions to the historical operator with the obligation to open its network infrastructure and to maintain Universal Service Obligations (USO) to consumers (Cave & Prosperitti, 2001). During this process, several dynamics became stronger such as the fast rate of technological development and new entrants into the liberalised telecommunications market.

The 1999 Communications review was about redefining the current regulatory framework and to establish the foundation of a liberalised market. The next phase of competition was about the assessment of the effect of economic regulation and the emergence of competition across liberalised markets. Thus, the market forces at play would shape the telecommunications sector, in which new entrants and incumbent firms (former monopoly operator) were to increase their level of innovation and their ability to strategize in order to gain market shares in their respective markets but also to shape potentially profitable growth markets.

3.1.4 Competition law and the common regulatory framework since 2003

The objective of the new regulatory framework was about the development of competition in the European telecommunications market, to levy the asymmetric regulation imposed upon incumbent firms, and to simplify the legal instruments.

In this phase, the regulatory authority encouraged a market based competition with the further implementation of competition law principles. The new regulatory Framework for Electronic Communications Network (2002/21/EC) led towards a decrease of regulatory measures. Thus, competition issues were related to *market dominance* and firm's conduct and behaviour among players. The new regulatory framework provides incentives to the incumbent firm and entrants to deploy innovative strategies and the emergence of new actors and interdependent value network of partners' relationships (Li & Whalley, 2002) at the micro level and *de facto* at the industry level.

4. THE EUROPEAN MOBILE AND PERSONAL EQUIPMENT AND THE CASE OF THE FIXED MOBILE CONVERGENCE (FMC)

The study of the European mobile telephony market aimed at understanding to what extent variables such as technology, regulation and market dynamics have led towards the early vertical re-integration

process between different layers of the telecommunications markets. Two major events occurred in the mobile industry: First, in the 1970's with the use of the semiconductors in the mobile handsets; secondly, in the 1980's with the adoption of the GSM standard, the single European standard.

This part will distinguish two phases: the first part is before the liberalization when the telecommunications industry evolved from a vertical integration towards a vertical disintegration of the industry since the industry deregulation. Then, the second part focuses from disintegration to the early stage of re integration of the industry because of the co-evolution and the technologies integration in the manufacturing of the mobile handsets, the different firms' strategies in shaping a future market or leading markets restructuring at the forward or the backward of the value chain alone or with strategic partners through collaborative arrangements on common research and development projects, strategic alliances or acquisitions of firm's owner of complementary technology competences.

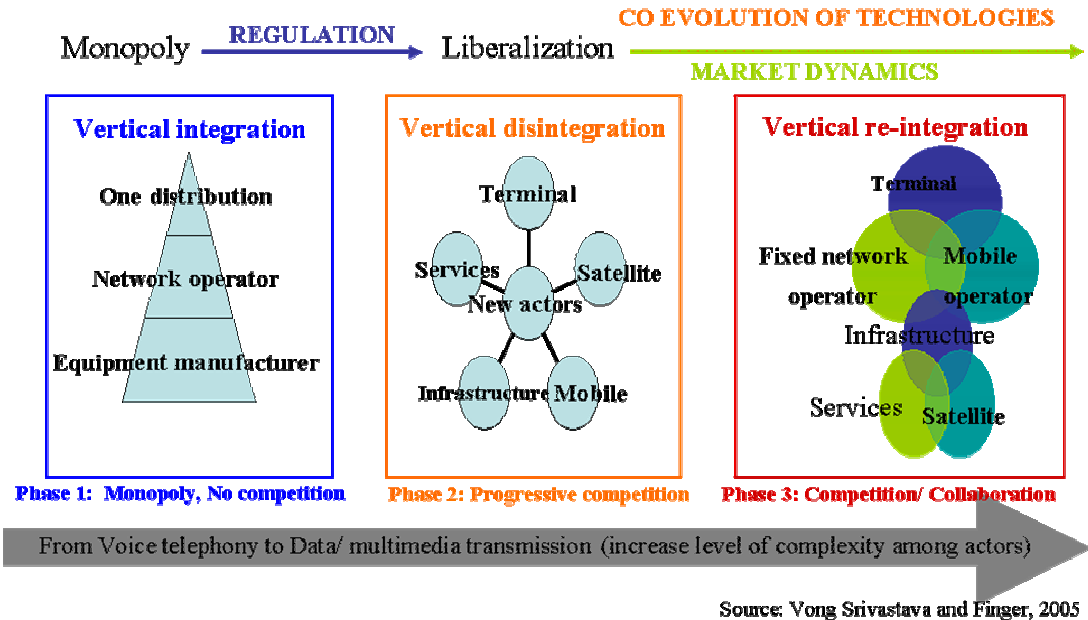


Figure 1: Evolution of the European telecommunications industry structure.

4.1 From integration to disintegration: the influence of regulation

Prior to the liberalization of the European telecommunications markets, each aspect of the value chain of the industry was vertically integrated as the result of a monopolize market. Each government was the asset owner of the value chain. The industry structure was characterized by a vertical integration among players and the absence of competition.

The layer model approach enables a distinction among players according to their activities, how firms develop their capabilities and analyze the vertical integration among players within an industry over time (Krafft, 2003, p.632). According to Fransman (2001), before the liberalization process, the telecommunications value chain was composed of the equipment suppliers (network, switches), network operators (infrastructures) and services (voice and fax transmissions) layers. Indeed, the European telecommunications markets liberalization was to dismantle the prior industry structure with the absence of competition, by letting new entrants to compete for market shares.

In this context, the liberalization of the mobile market started with the consultative debate about the mobile and telecommunications markets (Green Paper COM (94) 145). The interconnection in the telecommunications industry is characterized by the selection requirement of a common standard in order to ensure operability and roaming in the different Member States. In Europe, the selection of a common standard was chosen among the different technologies available at that time. In 1980, Global System for Mobile Communication (GSM) became the European standard and allowed a pan-European roaming.

4.2 From Disintegration to re-integration: the influence of market dynamics and the co-evolution of technologies

According to Fransman (2001), after the liberalization, the Telecoms industry structure was characterized by additional layers providers of new activities and products offerings.

Layer 1: equipment and software suppliers (i.e., switches, transmission equipment, routers, servers, billing software);

Layer 2: network operators (management of the fixed and mobile telephony infrastructures and services, internet and multimedia);

Layer 3: connectivity (Internet Service providers (ISPs): internet access and services providers of web hosting facilities);

Layer 4: navigation and middleware (firms providing search engines, browsers, portals, security, electronic payments, firewall and data protection services);

Layer 5: applications content (Web designers, e-commerce, information services and broadcasting content production and services).

The evolutionary trajectory path of this industry is defined by the presence of innovations within specific layers, the diffusion and the market growth / cross industry effects (Sabat, 2002), the information technologies, the improvement in semiconductors and fiber optic technologies, the advances in software applications. These developments led towards many improvements in infrastructure telecommunications networks and services. The mobile handsets became complex multi-technology products and firms started specializing in specific technology fields, leading towards a further division of tasks and knowledge among actors. New players entered the markets as the result of the progressive markets liberalization in equipment manufacturers, infrastructures and services.

Innovation, evolving capabilities and specialization were pushing different groups of firms to adapt to a changing environment through long term collaborative arrangements and the leveraging of partners' competences and complementary assets. This is specifically the case within (i.e. vertical integration) and between (i.e., vertical specialization) layers of the telecommunications industry (i.e., the partitioning of the industry is defined in terms of the coordination of activities within and between different segments).

4.2.1 The co-evolution of technologies

During the industry life cycle, an industry undergoes major transformation and evolutionary phases (Anderson and Tushman, 1986) under which the industry structure is shaped by the number of players

(Porter, 1980), the diffusion of the new technology is moving from product innovations towards a more oriented process innovations (Utterback & Abernathy, 1975), the technology diffuses in a path trajectory (Dosi, 1982). Different types of innovations emerge in the market, either to improve the current technology's performance in the market or to reconfigure the technology specificities (i.e., incremental, disruptive, sustaining, radical, architectural, modular) (Anderson & Tushman, 1990, Henderson & Clark, 1990; Sanchez and Mahoney, 1996; Christensen & Bower, 1996).

Tushman & Rosenkopf (1992) analyzed the emergence of technological progress and the dynamics evolution and interactions across political, organizational and social influences interactions over time. The authors argued that the social aspect and the surrounding environment of the technology, including the interactions among different actors contribute in shaping the outcome of technological progress. Thus, a better understanding about the influence of different actors and their interdependencies such as firms, community of practices, institutions, and lobbying groups enables an analysis of the process leading to the emergence of new technologies and technological system.

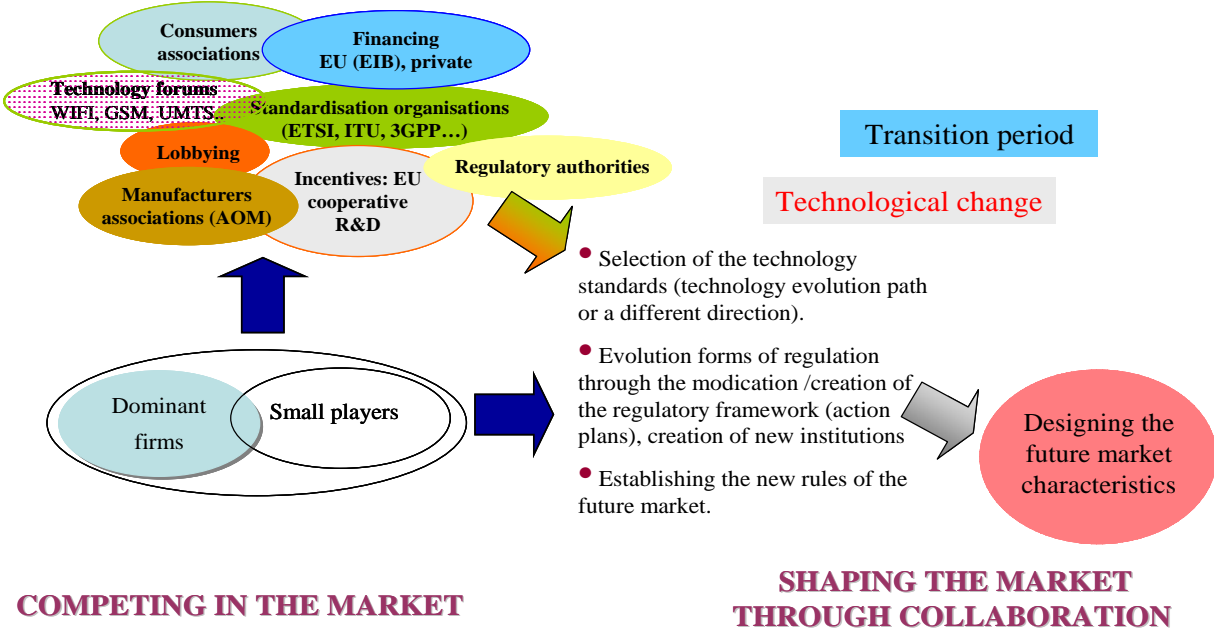


Figure 2: Shaping the industry structure in a dynamic environment.

The case of the Research and Development programs in the European telecommunications industry is a good illustration about how institutions influence the future shape of a market by offering different forms of incentives. The objective of a technology policy is to provide financial and non-financial incentives towards targeted research and development programs to various stakeholders. During the liberalization of the European telecommunications markets, several initiatives were created with the objective to advance the development of fundamental research in specific technology areas. The influence of institutions was an important component in shaping markets and sponsoring the development of new technologies.

Overall, the main objective of such initiatives, at the community level, was to provide incentives to different actors – public institutions, communities of practices and private enterprises – in order to invest towards specific fundamental research in the fields of communications. These initiatives were targeted to provide EU financing and to contribute to subsidize additional costs from fundamental

research, to develop content production for emerging technologies. The most important aspect of such a public policy was the indirect establishment of common European standards among participants in order to achieve interoperability, to create the conditions of a long term competitive market and to 'push' technological progress. Indeed, the level of innovative activities could be achieved through financial and non financial incentives. So, different actors in a market could direct their attention towards the development of specific technological innovations. Thus, public institutions contributed actively to encourage the process of the future characteristics of emerging technologies in the European telecommunications industry through initiatives such as the management and the coordination of European cooperative Research and development programs in the fields of communications.

The selection of a particular technology standard, at the regulatory level from the Commission, involved long term investments from different actors in the mobile industry, such as telecoms operators, equipment manufacturers and service providers. The choice of a technology standard required the actors' strong financial commitments and led towards the resource allocation in R&D programs, employees' training and so on. Thus, an ecosystem formed around a common technology standard in order to promote interoperability, but most importantly, to ensure economies of scale in order to realize profitability. In short, the long term commitment to a particular technology standard leads an industry to a certain path-trajectory (Dosi, 1982), and the back up of institutions in order to promote this technology through the funding of common research development programs by means of the deliverance of funding grants to Universities. Hence, in this case, it is about the selection of a systemic perspective of innovation.

4.2.2 The European mobile telephony

The mobile telephony value chain is composed of the following actors: equipment manufacturers, network operators, terminal device suppliers. For each generation of technologies, there had been a reconfiguration of power within the value chain among actors. These changes occurred across the telecommunications industry because of the different technologies evolution in other industries and innovations from different levels of the mobile industry value chain. The mobile telecommunications has undergone through three technology transitions and a fourth generation of technology is at an early stage of development.

1. The first generation of technology was from 1915 to 1925, with the introduction of radio technology and the voice transmission.
2. The second generation of technology was from 1925 to 2003 with the 2G and 2, 5G.

During this period, major technological improvements occurred in the fields of software and hardware developments, the transition from analogue technology to digital technology voice networks and the diffusion of the microelectronics revolution with the emergence of the semiconductor technology. The increasing performance of these technologies led mobile manufacturers to improve the characteristics of the mobile handsets; network operators could offer additional types of services and generate more revenues from services such as Short Message Service (SMS) to their customers. This limited data transmission and messaging systems were possible and products designs reflected these changes with the introduction of in-built camera phones, ring tones download, and so on.

3. The third generation of technology was from 2003 to current, this phase represented the launch of high speed data transmission, the true convergence of multi media contents with the videophones. The emergence of this market has required long term financial commitments, in some countries, telecoms operators had to purchase a 3G license from national government, and committed to build the necessary infrastructures with the transmission equipments and networks, the set up of new generations of antennae based on a different frequency than the 2, 5 Generation technology. Many wireless technologies alternatives are available in mobile industry.

In Europe, the third Generation of mobile communications systems is built on the Universal Mobile Telecommunications Systems (UMTS). This technology standard requires the development of complementary technologies and infrastructure networks such as a broadband technologies and the production of multimedia content and services. European initiatives encouraged such an infrastructure development. As such, the selection of the UMTS standard led to the establishment of a regulatory policy in partnership with the main industry players. The adoption of a framework was to lay down the foundation of a common approach in the fields of mobile market and personal communications.

The adoption of a European common policy in the mobile market served to co-ordinate the introduction of UMTS and to allocate a limited number of 'scarce resources' (i.e., frequencies a limited number of licenses) and to provide incentives for the development of this emerging market. The main objective of such an initiative was to continue the development of a Pan European network and to include the mobile communications market as part of the implementation of the Trans-European Telecommunications Networks in the context of a competitive market (TEN – Telecom). Indeed, the impact of the UMTS market is posing new challenges to other telecommunication markets, the necessity of the coordination among others initiatives such as the numbering systems between fixed-line and mobile (Green paper on numbering policy) and the development of an information society.

4.2.3 The mobile manufacturers and the mobile operator relationship

The relationships between mobile manufacturers and mobile operators evolve over time as the result of the changes in the industry at the regulatory level, the progressive markets liberalization and the fast rate of innovation and diffusion of technologies within the industry. The mobile network operators focused on tackling the exponential growth of mobile services by increasing their marketing and branding activities, investing in mobile communications infrastructures and implementing organisation efficiency.

From a technical side, the GSM standard allowed terminal manufacturer suppliers (Alcatel, Motorola, Nokia, Siemens and Ericsson) to levy entry barriers against foreign competitors by acquiring complementary technologies, increasing their research and development expenditures and establishing technology strategic alliances and realising economies of scale and scope in Europe. Thus, a vertical specialization occurred between the network operators and the equipment suppliers (Gerum at Al, 2004, p. 9). Firms behave differently and new entrants from others industries entered new business such as Microsoft. As such, Nokia entered the network equipment business because Microsoft entered the mobile operating system business by moving their expertise into the mobile operating system (Sabat, 2002). Nokia broadened its competences into four areas of businesses (1) by delivering mobile handsets to network operators, (2) to be present in media technology applications, (3) security

expertise to business enterprises solutions and (4) network infrastructures by offering services to mobile operators (source: Nokia.com).

As the mobile phones diffused and a dominant design (Utterback & Abernathy, 1975) emerged in the industry, the competition came from the downstream of the mobile telephony value chain. Manufacturing suppliers started to move forward the value chain by providing directly to network operators their own version of the handsets (example: Samsung corporation , a Korean firm). These changes modify the relationship among players, mobile operators worked closely with manufacturers regarding customising mobile handsets and imposing their own label into the handsets. Thus, collaborative Research and Development arrangements occurred between mobile manufacturers and mobile operators.

Furthermore, in western markets, the mobile handsets product life cycle reached a maturity stage. This situation pushed the established manufacturers such as Nokia and Motorola, to broaden their competences into emerging technologies and to broaden their expertise. The mobile handset became a multi technology product with increasing functionalities (Sabat, 2002). Thus, the process of technology convergence started, in which handsets manufacturers either acquired complementary assets, merged with another firm (Sony / Ericsson) or directed their research and development into new areas such as multimedia applications.

The integration of various components technologies and a deconstruction of the industry were taking place in which modularity and standardisation of technology interfaces enabled different suppliers to provide different components to mobile manufacturers. Partnerships in the mobile telephony industry increased (Sabat, 2002, p.515) in which mobile manufacturers became 'systems integrators' (Bruisoni, Prencipe & Pavitt, 2001) with the emergence of interface and modularity of component technologies to integrate. For example, Nokia kept core technology know how, built a 'system capabilities' enabling to integrate different interfaces (Stieglitz, 2003) but outsourced most of the production of its handsets to its suppliers located in different parts of the world, increased its levels of strategic alliances with specialised firms offering complementary technology assets.

The table below showed some examples of functions, firms select in order to shape a market. Jaworski et al. explained that firms can select to modify the characteristics of a market and the industry structure through specific targeted actions.

Table 1: Examples of different functions performed by firms in order to shape a market structure and impact at the industry structure.

Actors	Tasks and requirements	Business model and competitive advantage	Products	Competences and skills
'Vertical integrators' (Afuah, 2001) Or 'orchestrator' (Edelman & Heuskel, 1999) Example: Mobile manufacturer (layer 1) Nokia	Integration of modular components and interface standardization (Sanchez & Mahoney, 1996) from different layers into a product systems	'System integrator' (Bruisoni et al., 2001) Brand, reputation, distribution channels and marketing	Products systems Mobile handset product	- To control the 'integration system' - To understand the technological developments of the industry's value chain - To select a portfolio of players - To integrate the layer players (Rosenberg, 1990)
'Layer player' (Eldeman, 1999) Examples: Layer 1 of the telecommunications industry (Microsoft, Intel)	Specialist	To establish the technology as the industry standard by diffusing, cross licensing the technology, leading the future applications of the technology <u>Effect on the industry structure:</u> Vertical disintegration of the industry (Brühl & Stieglitz, 2005)	Core component within a product with modularity functions. Example: Operating system standard	Expertise skills in a technology knowledge Owner of the technology
'Navigator' (Brühl and Stieglitz, 2005)	Customize products offerings	Gather information from different suppliers	Repackage product components	Information facilitator

4.2.4 The Fixed Mobile Convergence (FMC)

The Fixed Mobile Convergence (FMC) is 'the integration of wireline and wireless technologies and services' offered by network operators in order to allow consumers to make communications calls by using seamlessly both networks.

Furthermore, the diffusion of substitute infrastructure networks based on different sets of technologies such as mobile and internet have contributed to the reconfiguration of the current industry landscape (Sabat, 2002). The fixed / mobile convergence is an example of the technological evolution between two markets, in which specific parts of different layers of the telecommunications industry are at the early stage of a reintegration process, at different levels of the industry value chain. The fixed / mobile convergence illustrates about the convergence between two markets in the telecommunications industry. The industry re – integration is due to the co-evolution of technologies in the wireless and the wireline applications and innovations in the telecommunications data / services.

To recall, in Europe, some of the mobile operators are also owner of the fixed line business (France Télécom and Orange, SwissCom and Swiss mobile, British Telecoms and O2). The growth of the mobile business has been growing since the early 1990's. New business models are emerging under which firms are collaborating across various layers of the telecommunications industry in order to establish the standard, to develop content applications, to develop network infrastructures, dual mode phones and so on. In different layers, firms can select different functions in order to shape the future characteristics of the FMC market based on their current capabilities, either by increasing their partnerships with different actors in different layers of the telecommunications industry. Opportunities

are occurring at different levels, for software providers, the FMC platform can be based on proprietary technology or open source applications. There are several opportunities in which firms can decide to select a forward integration across different market segments of the telecommunications value chain either by acquiring or collaborating together with the aim at delivering integrated services (Ciancetta et al, 1999).

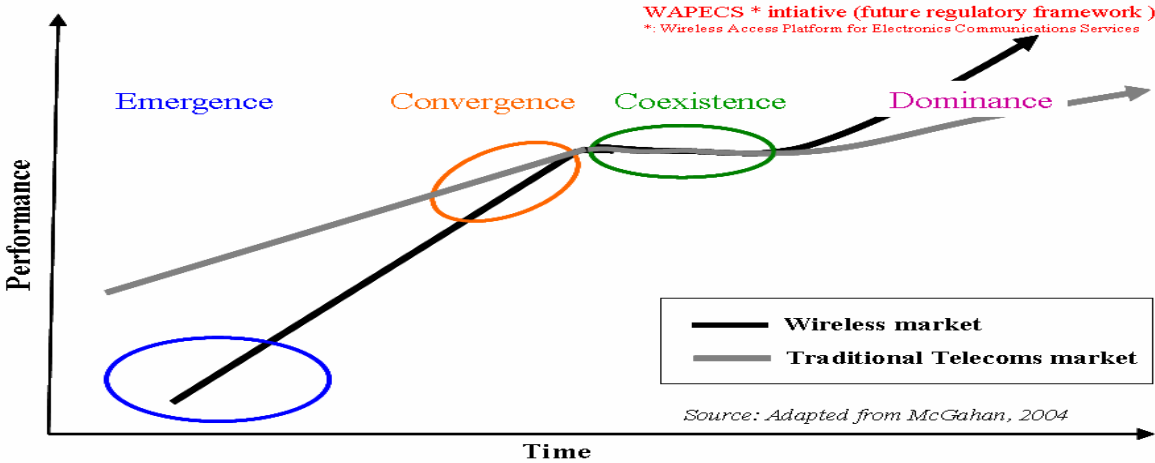


Figure 3: The evolution of the fixed and mobile markets.

The mobile trajectory path is increasing whereas the fixed line trajectory is constant (OECD, 2005). As a substitute technology, many customers are using their mobile handsets in order to make communications or looked for information from their portable devices. In the long term, the mobile trajectory will overtake the fixed line trajectory.

5. CONCLUSION

In this paper, we have observed the early reintegration process of the European telecommunications as the result of the co-evolution of technologies and market dynamics in a highly regulated environment. We have emphasized on the difficulty of assessing the industry boundaries because of the complexity interactions between technologies co-evolution and the shift in the value of resources among actors over time.

We illustrate our argument on the basis of two empirical cases from the European telecommunications industry. The first case looked at the history dependency and the evolutionary relationships between mobile manufacturers and mobile operators since the progressive deregulation of these two markets. The second case illustrates the evolution of the fixed and mobile markets, more specifically, on the fixed / mobile convergence. The substitutability among markets, technologies and the convergence of market boundaries over time are a good illustration of the early reintegration process between the fixed line and the mobile markets. Indeed, these two empirical evidences considered the changing dynamics occurring in the industry structure as the result of institutional influences, the evolution of different types of resources and technology components which are shifting the competitive advantage among firms over time. Thus, the study of several path technology trajectories illustrate cases of firms' strategic behaviors whenever the industry is being restructured or new markets about to be created in a highly regulated environment.

Overall, the paper highlights that in the case of the re-shaping of an industry, competition is not always the drivers. By highlighting the causes leading toward an industry transformation process from a systemic perspective, the paper draws the importance of collaboration among firms in times of change with the aim of future rents appropriation among a group of firms. A future research in this area will be to look into the diffusion of the internet and the potential impact on the current evolving telecommunications industry. As such, the emergence of VOIP services (Voice Over Internet Protocol) is posing new threats to the telecommunications industry with the arrival of new players such as E-bay and the acquisition of Skype, a provider of internet telephony (The Economist, Sept. 2005). The study of new entrants' business models may be an avenue to look at the outcome of another technology substitution as the result of the co-evolution of technologies in the field of communications such as network infrastructures and software development applications. This illustration may provide further insights into the mechanisms leading towards the European telecommunications industry re-integration.

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OVERVIEW OF REGULATORY MEASURES IMPLEMENTED BY THE EUROPEAN COMMISSION IN THE TELECOMMUNICATIONS INDUSTRY

Regulatory measures	Goal and content	Documents
<p>The 1987-1998 regulatory framework *</p> <p>* Verrue, R. (1999) Telecoms liberalization: key issues from the European point of view', January 1999. http://europa.eu.int/comm/information_society/speeches/verrue/telecomlib_en.htm</p>	<p>To set up the regulatory framework in which the conditions of competition in the market will apply to firms.</p> <p>Key aspects: (1) Interconnection of networks in order to allow interoperability and harmonization of the voice telephony services in the EU (2) Defining the concept of Universal Service Obligation (USO) (3) Establishing the Common Regulatory Framework for authorization and licensing. Documents drawn from the licensing Directive and the Full Competition Directive (4) Establishing the National Regulatory Authorities (NRAs) in Member States</p>	<p>Green Paper 1987 is composed of the White Paper single</p> <p>Market and EC Treaty Competition rules ,</p> <p>Article 100a Directives and decisions from the Council and the European Parliament</p> <p>Article 90 Directives from the Commission</p>
<p>Regulatory framework</p> <p>The 1998 legislative package on the liberalization and harmonization of the telecoms</p> <p>The 1999 Communication Review</p>	<ul style="list-style-type: none"> - Creation of a competitive market - Encourage new entrants to provide services in the telecoms - Authorise access to the incumbent network infrastructure - Maintain the basic universal services - Defining the right to new entrants. 3 types: (1) control of retail prices; (2) control of access prices, (3) Universal Services Obligations (Cave & Prosperitti, 2001) - Cooperation between sector specific regulators and competition authorities at National and European Levels 	<p>The 1998 Legislative package is composed of the Liberalization Directives and Harmonization Directives:</p> <ul style="list-style-type: none"> - Licensing Directive (97/13/EC) - Open Network Provision (ONP): (1) ONP Framework (Directive 97/51/EC) (2) Data protection (Directive 97/66/EC) (3) Interconnection (Directive 97/33/EC) (4) Voice Telephony (Directive 98/10/EC) (5) Leased lines (Directive 97/51/EC) <p>Implementation reports:</p> <ul style="list-style-type: none"> - Implementation of regulatory requirements; - Licenses and interconnections; - Local access; Universal services; - Mobile services; - Tariffs, cost and accounting; - Leased lines; - Data protection and access.
<p>The new regulatory package Framework Directive(2002/21/EC)</p> <p>The 2005 Communications Review (to be expected)</p>	<p>Response to technological and markets convergence Reduction of the degree of regulation through a decrease of legal instruments in the functioning of the market</p> <p>An evaluation of the regulatory framework currently in place as the result of the changes in the telecommunications market.</p>	<p>Framework Directive (2002/21/EC) and Four Directives:</p> <ul style="list-style-type: none"> (1) Access and Interconnection Directive (2002/19/EC) (2) Authorization Directive (2002/20/EC) (3) Universal Directive (2002/22/EC) (4) Electronic Communications privacy and data protection (Directive 2002/58/EC) <p>Recommendations and guidelines:</p> <ul style="list-style-type: none"> (a) Competition in the markets (Commission Directive 2002/77/EC) (b) Unbundled access to the local loop regulation EC No 2887/2000 (c) Market analysis and the significant market power (Commission guidelines 2002/C165/03) <p>Publications of the implementation reports due early 2006</p>

Source: This table is based on various EU documents

THE EUROPEAN TELECOMS INDUSTRY AND THE FIVE SECTORS REGULATED: TERMINALS, SERVICES, SATELLITE, MOBILE AND INFRASTRUCTURE

TERMINALS

- 1988: Terminal Directive
- 1991: Mutual Recognition Type Approval

SERVICES

- 1990: Services Directives
- 1991: ONP Framework Directive
- 1992: ONP Leased Lines Directive
- 1995: ONP Voice Telephony Directive
- 1996: ONP Interconnection Directive
- 1998: Voice Telephony Liberalization

SATELLITE

- 1991: Green Paper Satellite
- 1993: Mutual Recognition Satellite Terminal Equipment
- 1994: Satellite Directive

MOBILE

- 1994: Green Paper Mobile
- 1996: Mobile Radio Liberalization
- 1998: Removal of Service Restrictions

INFRASTRUCTURE

- 1994: Green Paper Infrastructure Part I
- 1995: Green Paper Infrastructure II
- 1996: Limited Infrastructure Liberalization (CATV)
- 1998: Full Infrastructure Liberalization

AN OVERVIEW OF THE EMERGENCE OF NEW INSTITUTIONS, COMMITTEE AND ASSOCIATIONS DURING THE LIBERALIZATION PROCESS

1988: As the result of the Council resolution of 30 June 1988 on the Development of the common market for telecommunications up to 1992.

Creation of the European Telecommunications Standards Institute (ETSI)

Focus on the harmonization of telecommunications standards. <http://www.etsi.org/>

1994

ENF: Establishment of a European Numbering Forum. The members are as follow:

- ETNO (European Public telecommunications Network Operators' Association)
- ETSI (The European Telecommunications Standards Institute)
- EITA (The European Information Industry Association)
- ECTEL (The European Telecommunications Manufacturers Association)
- ECMA (The European Computer Manufacturers Association)
- EIG (The GSM MoU European Interest Group)
- ECTRA (The European Committee of Telecommunications Regulatory Authorities)
- The European Commission

Duty: to prepare opinions, recommendations and reports for both the community and for ECTRA
(Source: Green paper COM (96) 590, p.5)

1998: As a result of the 1998 package

ONP Committee

Licensing Committee

2003: As the result of the implementation of the new regulatory Framework (2002)

The Communication Committee (COCOM) (replaced the ONP Committee and the Licensing Committee)

- Radio Spectrum Committee (RSC)
- Radio Spectrum Policy Group (RSPG)
- European Regulator Groups (ERG)

Duty: protection of individual privacy related to the processing of personal data.