

OPERATOR VALUE-CREATION THROUGH TECHNOLOGICAL CONVERGENCE: THE CASE OF VoIP

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JEL-Code: L16, O33

Key words: technological convergence, VoIP, value-creation, telecommunications

Abstract

During the past few years there have been numerous reports and articles from the telecommunications sector, focusing on technological convergence and aiming at presenting managerial implications for operators active in the industry. This paper adds to the discussion by suggesting that there lies value-creation potential in convergence processes. The case of VoIP is discussed and analysed as an example of a market, where incumbent operators are most likely not winners, but are rather defeated by new entrants (allowed by industry convergence) and other providers with more customer-focused strategies (such as pure VoIP providers, ISPs and cable companies). The paper raises questions concerning technological convergence and its role in the telecommunications landscape, which is characterized by increasing competition and technological development. The paper thus suggests that technological convergence may be used as a tool in order to create value for incumbent and service operators in telecommunications. Based on this study, one could assume that challengers and attacker's possess an advantage when it comes to converging markets such as the VoIP market, and creating value for both the firm and the end-customers. Incumbent operators entering the VoIP market are likely to cannibalize their own revenues and missing out on value-creation.

Introduction

The telecommunications industry can be characterized by huge changes and rapid technological developments that shape the market. In particular, the rapid shift of industry boundaries, and the resulting disruptive effects on established business models can be regarded as one major challenge for actors in converging environments. The currently occurring restructuring in the industry can be seen as a response to both technological and regulatory upheaval [25]. This field of industry has been the target for several exploratory studies and research due to the challenges it poses: regulation and policies are constantly in the need of updates, actors on the market change positioning, disappear and reappear if so is considered necessary and innovation management represents hence one of the most researched topics among engineers as well as business communities. In many cases, the effects of change are the centre of research, but more seldom is the cause, i.e. the factor behind the change, addressed in an extensive and thorough way. Mostly, the cause is identified; the process described shortly, where the focus lies more or less on explaining the results, the change and how to manage the phenomenon in various contexts. The notion of convergence is one example, as the concept is rarely investigated in depth and applied in an academic research context. Lind [35] also notes that almost no academic articles have tried to define convergence and relate it to a theoretical framework. Steinmueller [53], on the other hand, would like to see questions answered about how convergence is influencing our lives and industry - the directions of convergence - and also how rapidly convergence is gaining in influence - the rate of convergence.

The telecommunications sector is particularly affected by the process of technological convergence as it is characterized by rapid technological development and a turbulent environment. There is strong competition and new players entering and exiting the sectors affected by convergence and seeking new business opportunities in a converged environment. The examples of technological convergence are many and can be seen in various devices, such as PDAs, which enhance different features derived from different industry sectors or areas. Voice over Internet Protocol (VoIP) is another example of the convergence between fixed telephony and the Internet and offers an interesting opportunity to investigate technological convergence and its implications further.

Technological convergence is one of the topics that have raised interest in academia, but its definition and implications differ depending on which perspective is applied on the issue of convergence. Several types of convergence processes may be identified, such as technological convergence, industrial convergence, regulatory convergence. The basic assumption is that technological convergence leads to new convergence processes, such as the convergence of industries. The topic of industrial convergence has received much attention among researchers [2, 17, 20, 35, 55]. It implies that different industrial sectors come to share a common knowledge and technological base due to a process of technological convergence.

The paper focuses on the concept of technological convergence and its implications for telecommunications today. The very essence of the article discusses whether it is

possible, at least from a theoretical point of view, to benefit from and create value for the operator company in the process of technological convergence. Value-creation aims at providing the company with benefits of some kind, which may be used in various processes involving the company. The aim of the paper is therefore to *explore and discuss whether the technological convergence process may be beneficial for incumbent and service operators seeking to strengthen their position on the market and create value for the company.*

The study is structured as follows. It starts by presenting the process of technological convergence. The study then proceeds with a presentation and analysis of the value creation potential in technological convergence and motivation to why value creation fits the context of telecommunications. VoIP will then be presented as a descriptive case study of incumbent operators' ability to create value through the technological convergence process and will also include empirical data from a project concerning VoIP for residential customers, carried out in collaboration with InfoCom Consulting during 2004 and 2005. The study will be finalized by a critical discussion and analysis of the convergence process and operators' value creation potential within that context. Managerial implications for operators will be considered as well.

The method used in the study is qualitative and based upon secondary material about technological convergence and value creation as well as primary material (interviews) on VoIP and its relation to technological convergence. An up-to-date presentation of telecommunications markets and the threats and opportunities involved for various players will shortly be included. The paper aims at presenting and motivating a dilemma rather than presenting a complete case analysis and should therefore be seen as an initiative for future discussion about the roles of incumbent operators as well as the convergence process.

What is technological convergence?

What seems to be the most quoted source for a definition of technological convergence comes from the Green Paper on Convergence issued by the European Commission in 1997 [16]. The whole report is based on the fact that the sectors for telecommunications, media and information technology are increasingly using the same technologies. It is strongly pointed out that convergence is not just about technology, but also about services and new ways of doing business and interacting with society. The Green Paper on Convergence defines convergence as “the ability of different network platforms to carry essentially similar kinds of services or the coming together of consumer devices such as the telephone, television and personal computer” (p. 1). Convergence occurs at different stages, namely (1) technology and network platforms, (2) industry alliances and mergers, (3) services and markets and finally, (4) policy and regulation. The definition of convergence thus implies several different dimensions to the concept. Convergence can be addressed as industry convergence, or as service convergence, network convergence, infrastructure convergence and so forth. The OECD [41] presents two definitions of convergence, i.e. “the growing overlaps between the technologies, services and firms

active in each sector” (p. 93) and “the blurring of technical and regulatory boundaries between sectors of the economy” (p. 13). Bohlin [7] points out that in the literature, primarily what is being conceived as merged relates to technology, i.e. the integration of communications, broadcasting, telecommunications and computers, but in a secondary sense a number of other areas come into play. These areas are services, markets, related actor configurations (industry alliances and mergers), policy and regulation.

The main drivers behind the convergence process have been identified in existing literature. The foremost driver of the process is without a doubt *technological change* coupled with *liberalization* of telecommunications markets. *Regulation* has adopted in favourable ways, enabling the process of convergence to move on into different corners of our economy. *Socio-economic drivers* including the opinions and reactions of end-users is also one of the important drivers behind the convergence process, as is *the Internet* and *digitization* of data and information. Katz [31] points out that not only do other factors affect the timing and nature of convergence; these other factors also affect the rate and direction of technological change. According to Lind [35], the vision of technological convergence had great impact on corporate strategy in the 1980s and the 1990s. The European Commission indicated in 1997 [16] that convergence is leading to the creation of new market structures and new roles for market players. One indicator of convergence is the willingness of market players to exploit the opportunities and possibilities which are provided by the new platforms. Outsourcing and alliances are other factors, which are caused by convergence (see e.g. [17]). Basically, technological convergence originates from technological change and the emergence of new technologies. The emergence of a new technology is actually more complex than the migration of a single technology from one application domain to another [12]. Alternatively, technologies may undergo a fusion, in which the resulting technology is applied to a new domain [1]. Technology fusion “blends incremental technical improvements from several previously separate fields of technology to create products that revolutionize markets” [32, p. 70]. Rockenhäuser [47] points out that the convergence of technologies from adjacent industries is a highly complex process which requires a fixed grade of maturity of the concerned technologies.

Borés, Saurina and Torres [8, p. 1] define technological convergence as “a process by which the telecommunications, broadcasting, information technologies and entertainment sectors (collectively known as ICT – Information and Communications Technologies) may be converging towards a unified market”. There are as many different models on which areas are merging together as there are studies done on the topic. Duysters and Hagedoorn [14] predict convergence of telecommunications and computer industries to lead to a single information and entertainment industry. Fransman [17, p. 39] defines convergence as “the blurring of borders between telecoms, computing and media”. Adner and Levinthal [1] define technological convergence as the unification of formerly distinct technologies into a common application domain, which one of the antecedent technologies is already applied. In the latter definition we are already applying convergence on technologies, which forms technical or technological convergence.

A clear structure and classification of the different aspects of convergence is clearly

required, so that academic scholars are able to address the right process with the right concepts. For instance, industry convergence is a separate process from technology convergence, even though it is clear that both processes are related to each other. Articles written on the topic of convergence use the term without a systematic reflection of the definition they used [35]. A few exceptions do reflect upon the definition of convergence, such as Greenstein and Khanna [22], Pennings and Puranam [43], and Stieglitz [54]. Most articles on the topic have, however, taken an industry perspective. Steinmueller [53] argues that after two decades of movement toward convergence, the result is ambiguous. This is due to the *ex ante* definition of convergence, which was an idealization that was necessary to explain the implications of market developments opened by technological opportunity.

Implications of technological convergence for incumbent operators

The phenomenon of technology convergence in the ICT sector has been an observable and broadly discussed trend for roughly a decade now, and its implications have in general rather been associated with opportunities than threats [3, 4, 6, 11, 13, 15, 29, 37-39, 42, 49, 51, 57, 58]. We have seen personal computers decrease in size and increase in mobility, whereas in parallel mobile telephones have evolved towards rich terminal devices, both hence converging into multiradio access mobile computing stations. However, considerations mainly on end-user focused opportunities, such as new business models for application development enabled by this paradigm shift, have represented the most obvious effects so far, and have been subject to technology strategy planning for actors in this area. In other words, the implications on the underlying networks, and thereby on the operator market landscape in terms of business model changes have not received too much attention in this context, probably because its disruptive character has been perceived as relatively low.

Nevertheless, evolving market and technology trends, derived from the convergence development, increasingly expose telecommunication operators into an emerging dilemma. Applying the resource-based view [58] for analyzing the strategic positioning within in the ICT landscape, the basic elements forming the competitive advantage can be observed as consisting of the value proposition of offering a bundle of both data carriage and value added services (VAS). Whereas high margins are generated by the VAS [50], the critical resource controlled by the operator is, however, still the data carriage infrastructure itself, being part of the altogether margin-intensive service bundle. Based on this consideration, the sustainability of incumbent telecommunication operators' competitive advantage is endangered, as new entrants will push operator-independent services into the market, thereby decreasing the incumbents' control of the critical resource bundle.

The widespread adoption of Internet standards in telecommunication systems has been one of the most visible facets of convergence in ICT. Driven by the mobile device industry, this evolution of mobile phones towards personal computing units has been showing up new applications and service opportunities recently, forcing the underlying

networks to cope with this evolution. Especially the adoption of the internet protocol (IP) as the main network-level communication standard even in the wireless and mobile context, is a trend which in a longer term might change the competitive environment drastically. Whereas in the Internet pioneering years during the 1990s, circuit-switched telephone lines were used for connecting to the World Wide Web (WWW) using analog modems, today's paradigm is vice versa, i.e. the Internet is being used for carrying telephony services. Recently, major mobile device vendors have introduced first voice-over-IP based handsets, pushing the session initiation protocol (SIP) as the new open standard [50], paving the way for the final shift of voice telephony from circuit-switched communication towards packet-switched data transmission. As a consequence, once the entire content transmitted by the operator is implemented as packet-based data transmission, with no technical differentiation between voice and data anymore, operators will sooner or later have to modify their back-end infrastructure towards a full IP-based core. This migration will on the one hand assure operators' future compatibility with Internet systems thereby enabling them to implement the full range of service offering opportunities for their customers. On the other hand however, this will cause an unbundling of data and services for incumbent operators, forcing them to a strategic ambivalence and opportunism, i.e. repositioning themselves into to separate competitive environments in a respective manner. In the role of a data carriage provider, they will compete on bandwidth, speed, price and quality of services, whereas as a service provider, the operators will compete with any provider of similar services connected to the Internet. This will render difficulties in value creation according to the old manner [5, 27]: The same approach of benefiting from a strong customer base in the data carriage segment in combination with margin-intensive services will no longer be possible. Especially incumbent operators might risk losing control of VAS differentiation, as the customers might choose to use the operator for data transmission only, purchasing the services elsewhere within the value-generating network provided by the Internet. This will sooner or later transform the operator into to a "bit pipe" only, i.e. transporting data, but not providing content.

New players and increased competition

Another widely known strategic implication of convergence and a "new competitive landscape" is an increased reliance on corporate networks and strategic alliances [21]. A reorganization driven by changes in the competitive environment on the global market has one main driver, namely convergence (see e.g. [30]). Since government barriers on different markets were lifted, a large number of telephony and cable TV companies entered (and are still entering) growing markets and hence, the new players are threatening the market position of established actors. Numerous competitors in the industry are dependent on products becoming more and more substitutable. In such a case, companies increasingly need to compete on price [30].

Also, according to Clements [10], convergence encourages the arrival of new players exploiting niche markets. Day and Schoemaker [12] point out, that players in established industries are familiar, whereas players in emerging industries, or emerging technologies, most often are new or unknown. New players on the market force traditional actors to

enter, for instance, the entertainment market in order to maintain profitability. The arrival of new players exploiting niche markets suggests that this stage of industry convergence could be the bridge between what is already happening at the technology level and what will eventually occur at the level of services and markets [16]. This clearly indicates technological convergence as leading to industry convergence. In established industries, the domain of play is clearly defined, while emerging industries have a formative or evolving domain of play. Fransman [18] suggests that convergence will create new opportunities for both incumbents and new entrants in the form of new technical possibilities and new market opportunities. The competition will, however, be increased in three forms, namely between companies, between products/services and between technologies (e.g. VoIP competing with traditional fixed telephony; fixed versus mobile services; ADSL versus cable modems). The increased competition can on the other hand result in new threats to incumbents and to shakeouts.

Convergence as a value-creating process for operators?

Value and value-creation are difficult issues, as there are different aspects involved in the definition of value and the creation of value. In the business context value is initially associated with the value chain model presented by Porter in the 1980s [44] or in some cases with monetary value. However, Porter's ideas have offered a foundation for understanding industrial competition and value-creation in that context, even though his theories are criticized for e.g. not exploring the links between firms [33]. Porter defines value as what customers are willing to pay for a product or service. Other definitions of value often take a company perspective and network approach and imply that value is created between actors in exchange relationships. For instance, Kothandaraman and Wilson [33] regard value-creation as the main purpose of suppliers and customers to form a relationship of direct and indirect functions. Ramírez [46] views value as produced between two or more actors, with and for each other, which makes value being an outcome of co-production. Parolinin (1999) prefers to talk about value-systems and sees it as the set of value activities that are required for the construction of each product or service. Maitland et al. [36] emphasize that the concept of value creation is connected with that of the value chain and both are often associated with the areas of strategic management and marketing. However, there is also research suggesting that the value chain is evolving into a set of partnerships to deliver value [48] or that value chains are evolving into value nets or networks [19, 33, 34]. The value network, derived from the value chain concept, which each constructs will furthermore differ. The value-creating network as a concept, as presented by Kothandaraman and Wilson [33], depicts that network formation is based upon *an assessment of potential partner's abilities to add significant value to the market offering while presenting low risk and superior management*. Therefore, the concepts of value chain and value networks are closely related with each other and could therefore be a useful tool. The value network is, according to Christensen and Rosenbloom [9], the context within which the firm identifies and responds to customer needs, procures inputs and reacts to competitors. As firms gain experience within a network, they develop their capabilities, structure and cultures to fit that position better by meeting the requirements of the network. As the

value chains deconstruct into value networks, a multitude of entry points into value networks emerge. New players from other industries appear, as they see new opportunities form in the light of the technological convergence process backed up by the opening up of markets, as well as their reconstruction. The environment that players are facing is increasingly complex and market positions are threatened. One means of coping with the new challenges is for the companies to put effort into developing their dynamic capabilities or positioning themselves within the value networks in an appropriate and productive way (see figure 1). This means that firms would want to establish relationships to those firms that have unique capabilities if they wish to survive the turbulent markets of telecommunications. Therefore, the convergence aspect also comes into play in value-creation activities, as technological convergence in many cases requires co-operation between actors. One important way of navigating the value chain is through partnerships. Ideally, companies specializing in one phase of the value chain would prefer to partner with companies who are able to manage other parts of the value chain (or phases of the process).

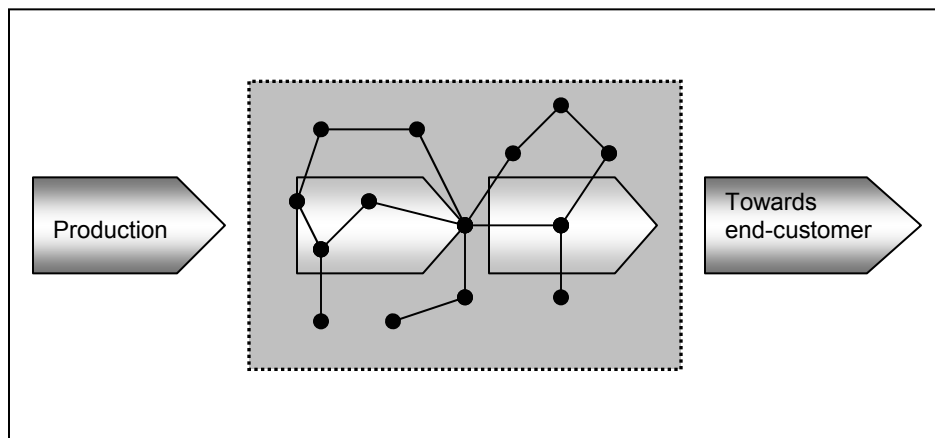


Figure 1. Value chain replacement by value network

The discussion above suggests that operators are able to create value in the convergence process by seeking the most profitable partners for developing products and services, as in most cases companies do strive at creating value. However, in order to succeed in such a mission, the process of technological convergence (or any other process of convergence such as industry or regulatory) should be identified and known. The fact that every firm is linked to business networks should be acknowledged and benefited from in the most profitable way by operators. Industry convergence implies that new actors are able to enter the market. In fact, current and established operators should consider partnering with new entrants in order to “stay with the flow” and access capabilities which are needed for future technological developments. Value chain deconstruction into value networks is an important step in the struggle to survive on the telecommunications market and eventually also in order to create value for both the company itself and for end-customers.

Case: VoIP and value-creation through technological convergence

VoIP is a pure example of technical or technological convergence, where the Internet meets fixed telephony. The market for VoIP can also show other examples of convergence processes, such as industry convergence. There are an increasing number of new players entering the market for internet telephony. For instance, in the case of Germany there were no real commercial VoIP providers in early 2003, but in September 2003, the German subsidiary of nikelinc introduced its VoIP service. In November 2003, the German broadband operator QSC also introduced a service, followed by Broadnet in December 2003 and Indigo Networks in January 2004. Since then the number of service offerings have increased dramatically and it is estimated that there are around 20 residential VoIP service offerings in Germany [56]. Several large operators, such as T-Com/T-Online and Arcor, as well as cable operator Kabel Deutschland, are expected to launch their VoIP services in 2005. VoIP does not only offer a tremendous business opportunity for various service providers, it also puts strains for operators concerning the existing ways of structuring business. For instance, the effects of such a service as VoIP on incumbent operators can be seen in the falling revenues of incumbents in the telecommunications sector and their struggle to attract customers and develop their service portfolio to match the expectations of customers. Today a shift towards offering bundled services can be increasingly observed, i.e. mobile and fixed telephony, broadband Internet and cable TV in one and the same subscription, as customers of today demand more convenient service offerings. On the other hand, the technical implications of convergence cause an unbundling of data carriage and value-added services, as the increasing all-IP based domain allows the end-user to choose a service anywhere out “in the net”, and not necessarily from the operator’s proprietary offering. This change in consumer preferences and the parallel emerging collision of traditional business models will eventually change the strategic control of players in the telecom sector as well. For instance, some predict that IP-telephony will replace traditional PSTN based fixed telephony whereas some say that this will not occur without conquering obstacles such a quality of service and the access to emergency services. Regulation concerning VoIP is still an open question in many European countries. Eventually the regulation will affect the service provision of commercial service providers as well as those offering VoIP free of charge (e.g. Skype, MSN Messenger). For instance, Skype was forced to withdraw its VoIP offering from the Norwegian market due to regulative aspects [40].

One might say that technological convergence leads to opening up of borders and entrance of new players leads to more competition, which affects the incumbents’ strategies. In the case of Finland the incumbent operators Sonera and Elisa were among the first ones to launch residential VoIP. Sonera has always been a pioneer in launching new services and VoIP might be seen as yet another innovative service raising the prestige of the company. By launching VoIP, even though the service offering is not as attractive as most other European providers, Sonera makes a statement that they are on the market and they are competing with and against new players as well as old, established players. Telia in Sweden gives the same kind of impression, but in this case, the challengers were the first ones to open the market for residential VoIP offerings,

while Telia waited before adding VoIP to their portfolio. The challengers had one year to shape the market for residential VoIP, before the entrance of the incumbent operator.

For traditional telecom companies, incumbents, which realize most of their revenues with traditional PSTN telephony, VoIP simultaneously represents a threat and a new opportunity. By launching their own VoIP service, there is a risk that the incumbents cannibalize their own revenues. However, if they do not launch any VoIP service, they will lose market share to other providers. Thus incumbent operators are trying to launch VoIP services in such a way, in particular combined with broadband connections, Internet access and other Internet services, so as to minimize the cannibalized revenues and maximize overall revenues per broadband connection [56]. The challenge for traditional operators will be whether they stand aside from the technology and watch competitors offer VoIP and further reduce their revenues and market share or whether they themselves launch a VoIP service and in effect cannibalise their own revenues.

There will always be a question whether incumbents are able to profit from VoIP. Average revenue per user (ARPU) is falling for both fixed and mobile telephony, and the slow reactions to competitors' VoIP offerings in most European countries may have wounded the incumbents. The topics of cannibalizing revenues and destroying business are close in this case: is it worth it to invest resources in developing services such as VoIP for a market, which logically seen is not profitable? Only if the incumbents bundle services are they able to make profits out of VoIP, but something has got to give, e.g. fixed telephony ARPU will experience a significant decrease. The challengers, on the other hand, are able to shape both the market as well as the organization as such, its focus on service offerings and target groups. Even though a challenger may possess little resources, no existing customer base etc, reading the market demand right and offering an attractive bundle of services to the right price, a challenger may very well experience the attacker's advantage, set technological standards, orchestrate prices and take advantage of incumbents' weaknesses.

In short, what we are facing with VoIP and technological convergence in telecommunications is a restructuring of the market and a redefinition of core business. Thus, the study proposes that service operators may develop their business through the technological convergence process and restructure their business in order to fit with the demanding and turbulent external environment (indirectly leading to value creation). In fact, mobile operators face an advantage in the concept of VoIP. Incumbent operators are today launching VoIP offerings and in effect cannibalizing their own revenues. Those incumbents who see an opportunity in bundling services, such as France Telecom's triple play offer of VoIP, TV and Internet over ADSL, may benefit from offering VoIP, whereas other incumbents price their VoIP calls on the same level as PSTN calls. Users are seeking cost-efficient or even free calls over the Internet, rather than a primary line based on VoIP. For instance, Telia and Sonera have both chosen the above mentioned pricing scheme and both are increasingly losing market share to challenging ISPs and pure VoIP providers such as Bredbandsbolaget in Sweden and Ipon Communications in Finland. So far, the mobile operators are not offering VoIP, as this is taken care of by the fixed side of an operator or independent ISPs and VoIP providers. However, technology

developers are already - at least in theory - placing VoIP in mobile handsets. Mobile VoIP would enable operators to benefit from lowering their overall costs and increasing ARPU and users profiting from better quality, and even having only one single phone number for home and office. The ability to roam between mobile and VoIP networks can save business customers' (companies) and consumers' money by allowing them to save their limited mobile phone minutes when they have access to a wired or wireless LAN in their homes or offices. Mobile operators can benefit by combining a VoIP service with traditional mobile phone plans, so they do not lose revenue from calls that subscribers otherwise would make on a separate VoIP provider's network. There is, however, a question of whether mobile operators have integrated WLAN in their networks and are able to offer mobile VoIP [52]. A report by Pyramid Research [45] urged that mobile operators must react soon by integrating new delivery networks like wireless LAN and moving towards mobile VoIP, otherwise they risk losing ground to fixed operators, who are aggressively seeking to incorporate mobile services into their portfolios.

Therefore, VoIP and convergence processes can become important sources of value-creation for mobile and service operators, whereas incumbent fixed operators might be jumping on the wrong horse. It might be very harmful for an incumbent to follow a strategy of constantly following new technological waves and hypes. In an operator case, this can partly be seen as a culturally, partly as a historically implied characteristic, as many formerly governmentally owned operators represent a technology advancing culture, and are driven by prestige when it comes to adopting new technological innovations. Instead, the incumbent should in times of rapid technological change rather critically assess and continuously refine its own strategy based on a strict resource-based view (RBV) [22]. In other words, instead of enthusing itself about the ideas the other (especially challengers) are pursuing and thereby jumping on (if at all) short-term promising hype trends, the business model revision and redefinition should investigate what the real critical resources of an operator are, and based on that, build their own, distinctive business models. In particular, a feasible, although rather opportunistic approach would in parallel consist of actively "blocking" the convergence development, if at all possible. One could argue that technological convergence in the end implies positive effects for challengers firms, whereas established incumbent firms are more likely to fail in converging environments. This, again, supports the theory that technological convergence could represent a special case of disruptive innovation, given the fact that the characteristics are the same, i.e. challenging firms outperforming incumbents in several cases.

Critical discussion and conclusions

Mobile operators are likely to undergo a similar development as fixed operators already have, they will become data carriers only. The only difference however is, that the mobile operator has invested a lot of money into services and infrastructure [50], whereas the fixed operator has focused on sophisticated value-creation in terms of data carriage only (e.g. broadband data).

In general, a total reinvention of the operator business concept will sooner or later become inevitable. In an historical retrospective, one could argue that this is no news, and actually just a final part of deregulation. Whereas most European incumbent operators for instance today are privately owned businesses, the biggest and most prestigious of them tend to originate from formerly state-owned post and telecommunication agencies, which started to disintegrate and privatize operations during the 1990s. As these industry conglomerates became open business models and part of a free competitive environment, they in result always had to give away slices of their traditional monopoly businesses. After the traditional post, telegraph and telecommunication institutions were separated, the remaining telecommunication businesses in many countries still had to step by step give away several opportunities of value generation opportunities based on changes in regulation, such as television channels broadcasting, cable TV infrastructure, and internet service provisioning.

As one conclusion, one could argue that technological convergence in the end implies positive effects for challengers firms, whereas established incumbent firms are more likely to fail in converging environments. This, as already mentioned, supports the theory that technological convergence could represent a special case of disruptive innovation, as the characteristics are the same, i.e. challenging firms outperforming incumbents in several cases [23]. Those incumbents, which manage to ‘face the brutal facts’, to critically assess their core competencies and related opportunities in the emerging environment, and finally to derive innovative solutions from the new technological paradigm, will succeed in leading the convergence process, instead of following it.

Technological convergence furthermore initiates other convergence processes, such as industry convergence. Industry convergence is one major reason behind the entrance of previously unknown players in the fields of telecommunications. As industry borders become blurred, actors seek business opportunities elsewhere than in their traditional markets. This is also the case for incumbent telecommunication operators, who are obviously entering the market for VoIP in order to establish a presence as well as reach some short-term revenues. Only if the incumbents realize the power in unbundling services do they have a chance to survive the competitive VoIP race [24, 26, 28]. There is also a question raised about the future of VoIP, as technology developers are already - at least in theory - placing VoIP in mobile handsets. Mobile VoIP would enable operators to benefit from lowering their overall costs and increasing ARPU and users profiting from better quality, and even having only one single phone number for home and office. The question is, whether current incumbent operators are in a position to provide such a service model.

Whether operators are able to exploit and benefit from convergence processes is a fairly interesting question, as future competition clearly evolves around value creation – both for the company and for the end-customers. In the case of VoIP the question is whether end-customers choose free of charge VoIP offerings before the incumbent’s bundle offerings. The question to be asked for the incumbents is whether VoIP is lucrative enough to invest in and whether return on investments will be satisfying enough. Value can be created through focusing on core competencies rather than riding the hype of

technology development and convergence. Developing the company's value network in order to find partners for maintaining customer satisfaction (e.g. develop converged products and services) might prove to be a better strategy than keeping one foot in all possible markets which in fact are outcomes of convergence processes.

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