The Transformation of Telecoms Industry Structure: An Event Study

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Abstract

This paper looks at events that potentially alter the market structure within the telecommunications value chain. We are interested in the value effect of these events on telecommunications carriers to find out how well carriers are currently positioned to face future challenges.

1 Introduction

In the past three years the telecommunications industry has yet again started to undergo a major transformation. This transformation does not merely concern *how* a set of given services is offered. Rather, technological change and services innovation are fundamentally altering the way people communicate and the nature of the services they use to support their new communications patterns. In particular, recent changes include a shift of the telephone network from being a physical network to being a (potentially converged) Internet application, the shift from a focus on connectivity to a focus on content, and the shift from dyadic communication relationships to social networking.

In this new emerging new telecommunications paradigm, traditional business models are increasingly replaced by alternative models, and players that previously controlled the telecoms value chain are rapidly loosing ground against new entrants, some of which entered from "outside" the traditional telecommunications services industry, and some of which did not even exist ten years ago. For example, Google emerged as world market leader for online searches and has thereby established itself as a significant player in the telecoms value chain. Google is also – directly or through investments – involved in the rollout of Internet access infrastructure. Not surprisingly, in September 2007 the combined market cap of Google and its closed competitor, Yahoo!, surpassed the market cap of AT&T.

While there exist a number of studies that analyze telecommunications carriers' performance in their traditional line of business, little research has been conducted as of today to quantitatively assess the new strategic directions that firms take in this changing environment. This paper summarizes a set of event studies which look specifically at activities (by telecom carriers themselves, or by other related firms) that aim at vertically integrating different segments of the telecom value chain, and the implication of these activities on telecom carrier performance. We are interested in knowing to what extent the carriers are threatened by other firms' initiatives targeted at "invading" their turf, and how effective they are in countering such threats.

This paper is organized as follows. Section two will provide a brief introduction into the research background and method, and the data collection. Section three will discuss the empirical results. Section four will summarize and conclude.

2 Research Background and Method

2.1 The Telecommunications Value Chain

Since this paper is first and foremost concerned with changes in the telecommunications value chain, it is important to start by defining what precisely we mean when we talk about this value chain. Value chain models can generally not be discussed in terms of whether they are right or wrong, but only in terms of whether they are useful in structuring a given problem or illustrating a certain point. In this paper, we will use a modified version of the layer model discussed by Fransman (2002). This model breaks the industry into 5 layers, which are depicted in Figure 1.

Layer 5	Content Provision
Layer 4	Content Integration
Layer 3	Network Operation
Layer 2	Facilities Provision
Layer 1	Equipment Manufacturing

Figure 1: Telecommunications Value Chain

Firms in Layer 1 focus on the manufacturing of telecommunications equipment, including both networking equipment and customer premises equipment. Examples for companies operating on this layer are CISCO, Nortel, Nokia, Motorola, Sony-Ericsson, but also Apple (due to their widely celebrated iPhone). Layer 2 comprises of some of the key elements of the traditional telecommunications operator business,

which is the ownership of network facilities. Facilities include cables as well as licenses to spectrum. Companies that dominate this layer are the likes of Verizon, AT&T, Deutsche Telekom, or SingTel, but also cable operators, or the mobile carriers such as Vodafone, Orange, or M1. Layer 3 is the operation of networks, which may or may not involve the company owning the underlying infrastructure. The separation of facility ownership from service operation is common in fixed line telecommunications, but may also become a more common model in the mobile communications value chain. After all, the regulatory foundations were recently laid - the conditions for the FCC's 700 MHz frequency band auctions include an open access rule, which in facilitates market entry of purely "service based" mobile operators. Layer 4 is concerned with content integration (Fransman refers to this layer as "Navigation and Middleware") and is dominated by Google, followed by Yahoo, and Microsoft. Finally, the top Layer encompasses all activities related to the provision of content. This can be, for example, the production of movies or news, the provision of online brokerage services, online travel brokers, or the development of games. Notable companies in this layer are Time-Warner, BMG, NBC, Travelocity.

It is important to note that, while most companies originated predominantly from one of these layers, many of them have tried to vertically integrate into activities in different upstream or downstream layers of the telecommunications value chain. Again, to give some example, Time Warner acquired AOL, and Deutsche Telekom bought (and later sold) the online newspaper "Bild.de".

Attempts to extend market power in the telecom value chain are not necessarily limited to the acquisition of ownership stakes. Rather, they often take the form of organic entry. Some of the most discussed examples of the past years is Apple's launch of the iPhone, which threatens various traditional players in the value chain. Besides effectively becoming a new player in the hand phone equipment market (Layer 1), Apple has managed to (technically) tie their handset with their online music and video store iTunes (Layer 4), and even negotiating cuts in the mobile operators' revenues from network operation for letting them exclusively sell their iPhones. Apple has also secured a number of content deals with content provides, thereby extending their market power in the content integration layer. Nokia and Sony-Ericsson have followed Apple's lead by launching their own content platforms. At the same time, Google has been working on invading the handset market, not like Apple by producing a novel handset, but by working on a new operating system for Smart phones ("Android"). Google has also exerted their influence extending beyond content integration by first lobbying for an open access rule in the US 700 MHz spectrum auctions (such as to open the spectrum to resale if licenses were auctioned off at a price of at least US$ 4.6bn) and then bidding the price up this threshold such as to trigger the open access rule.

The traditional telecommunications carriers, while under threat from all sides to be reduced to "bit-pipes", have tried to counter the threats by also engaging in activities in vertically related markets. This includes initiatives like joining the open handset al-

liance, the development of mobile portals, or striking deals with content providers such as to strengthen their position in the content integration layer.

In the light of all of these activities, the question arising is how precisely the structure of the telecommunications markets are likely to evolve, which companies will be able to extend their reach and power, and whether there are companies which role may in future be reduced. In our view, the best place to look for an answer to these questions are the (forward looking) financial markets, which do react to the changes described above and reflect their evaluation in the market stock prices of the involved companies. We therefore conducted a set of event studies such as to assess the impact of various strategic initiatives on the valuation of telecom operators.

2.2 The Event Study Method

There have been numerous event studies undertaken in all kinds of areas, foremost in the field of finance and strategic management. For instance, Subramani and Walden (2001) study the returns to shareholders in firms engaging in e-commerce. Johnson et al. (2005) examine the impact of ratings of board directors by the business press on stockholders' wealth. Another area in which event studies have been widely used is in the evaluation of M&As. For instance, Wilcox, Chang and Grover (2001) analyze M&A events in the telecommunications industry by testing the impact of near diversification, far diversification, and the size of the firms on the shareholder value. Uhlenbruck, Hitt and Semadeni (2006) focus on acquisitions of Internet firms and the potential for the transfer of scarce resources in a resource-based view. However, event studies also lend themselves well to evaluate the impact of other kind of corporate activities, as long as they can be traced to some kind of singular event, such as, for example, a corporate announcement or a service launch.

The event study method is based on the assumption that capital markets are efficient such as to estimate the impact of new information on anticipated future profits of the firms. If information communicated to the market contains any useful and surprising content an abnormal return will occur. In a capital market with semi-strong efficiency one can assesses the impact of the event in question on the market value of the company by calculating the abnormal return - the difference between the actual post-event return and the return expected in the absence of the event (MacKinlay 1997). McWilliams and Siegel (1997) gave a good reason for conducting event studies: "The event study method has become popular because it obviates the need to analyze accounting-based measures of profit, which have been criticized because they are often not very good indicators of the true performance of firms". Therefore, it is expected that event studies will continue to be a valuable and widely used tool in economics and finance.

According to (MacKinlay 1997) an event study can be roughly categorized into the following five steps:

1. *Identifying of the events of interest and defining the event window size*

2. *Selection of the sample set of firms to include in the analysis.*
3. *Prediction of a "normal" return during the event window in the absence of the event*
4. *Calculation of the abnormal return within the event window, where the abnormal return is defined as the difference between the actual and predicted returns.*
5. *Testing whether the abnormal return is statistically different from zero.*

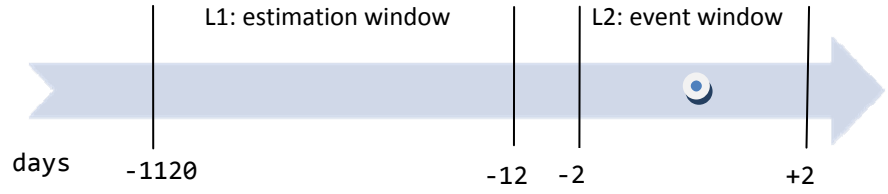
The events of interest in this study are of two kinds

(1) M&A announcements of major telecommunication companies that are listed in the US-stock exchanges or European stock exchanges. These include M&A announcements that involve some degree of vertical integration in the telecom value chain, and those events which do not involve vertical integration. Looking at both types of M&A (that is, with and without vertical integration) allows us to empirically contrast these two types of strategies.

(2) Any other kinds of events that constitute an organic vertical integration move in the telecommunications value chain. These include any new ventures that do not fall into the category of M&A activities. Note that we are looking not only at the telecommunications carriers own activities to integrate within the value chain. Rather an event is defined as any activity that aims at extending a firm's position in the telecom value chain. However, for all of these events we study only their value effects on the telecommunications carriers.

This study uses three symmetric event windows: three-day (1 day prior to the event day and 1 day after the event day), five-day (-2;+2), and 11-day (-10;+10) event windows. These window lengths are appropriate to capture any news that might have leaked shortly before the official announcement was made and also considers any short-term stock price reactions linked to the event after the announcement. The estimation window is the control period proceeding the event period. In this study, the estimation window (denoted as L_1) for all events ends 12 days before the event and extends back to 120 days prior to the event date. Estimation periods generally end before the event of interest so that the returns during the event window will not influence the model parameters.

Figure 1. Estimation and event window on a timeline



The companies we examine in this study are telecommunications companies that are listed in (at least) one of the major US or European stock exchanges. For our study of M&A events, the population consists of all M&A announcements released by these telecommunications companies. For the study of other (non-M&A) events, the population consist of a set of initiatives that directly are announced by these companies themselves, or that are announced by other companies but directly affect the telecommunications companies one way or the other. In practice, the population list of M&A announcements is generated by searching for specific words in the title of media and news releases.

If the impact of M&A announcements on stock returns is to be examined, a measure of what shall be the "normal" return for the given stock is required. 120 days of historical stock data will be used for each event. These 120 days are enough to calculate valid estimators needed for the event-study model (MacKinlay 1997).

The event-study methodology relates the historical stock data in the estimation window to the market index. In case of this study, the Dow Jones Sector Titans - Telecommunications Sector index was used as the market index, as detailed below. To predict each firm's market model, daily returns were used to estimate a regression equation over the estimation period. The underlying securities are assumed to be independently and jointly normally distributed and shall be identically-distributed through time (MacKinlay 1997). For any company *i*, the market model is specified as

$$R_{i\tau} = \alpha_i + \beta_i R_{m\tau} + \varepsilon_{i\tau} \qquad (1)$$

where $R_{i\tau}$ is the return of security *i* and $R_{m\tau}$ is the rate of return of the market portfolio in period τ. $\varepsilon_{i\tau}$ is the zero-mean disturbance term. α_i and β_i are firm specific parameters of the market model. The market model assumes that in the absence of the event, the relationship between the returns of firm *i* and returns of the market index remains unchanged and the expected value of the disturbance term $\varepsilon_{i\tau}$ is zero. Using this approach the resulting regression coefficients and the firm's actual daily returns were then used to compute abnormal returns for each firm over each day of the event window period. The sample abnormal return $AR_{i\tau}$ on the event day τ is calculated for the i^{th} firm by subtracting the predicted return of the market model from its observed return:

$$AR_{i\tau} = R_{i\tau} - (\hat{\alpha}_i + \hat{\beta}_i R_{m\tau}) \qquad (2)$$

where the coefficients $\hat{\alpha}_i$ and $\hat{\beta}_i$ are ordinary least squares estimates of α_i and β_i. The Cumulative Abnormal Return (CAR) for firm *i* over the event period $\tau 1$ to $\tau 2$ is then calculated as follows:

$$CAR_{\tau}(\tau 1, \tau 2) = \sum_{\tau=\tau 1}^{\tau 2} AR_{i\tau} \qquad (3)$$

where ($\tau 1$, $\tau 2$) is the event window interval; and all other terms as previously defined. The abnormal returns represent the extent to which actual realized returns on any of the event days deviate from the returns that was expected based on the estimated firm-specific market model. In this sense, the abnormal returns can be seen as prediction errors ($\varepsilon_{i\tau}$). MacKinlay (1997) then goes on developing the modthods to test whether or not the computed CAR is significantly different from zero. The respective formulas are omitted at this point, but can be found in many of the papers qoted above.

2.3 Data

The two data inputs that are required for the M&A event-study model are the events themselves, in this case M&A announcements and other non-M&A events, and historical stock price data (security prices and the reference index). They were both gathered from databases.

In order to explore the effects the selected events on stock prices, this research limits its scope to companies that are either listed at one of the major European stock exchanges (London, Paris, Frankfurt, Madrid, Amsterdam) or on a US stock exchange (NYSE, NASDAQ). The reason is that most of the telecommunication operators are listed on at least one of these stock exchanges. It is generally known that these exchanges provide a high public confidence due to the high standards and listing requirements. Thus, using only major exchanges also increases the price stability of the securities – an important prerequisite for the event study method.

2.3.1 Diversification through Mergers and Acquisitions

For our analysis of M&As we collected a sample of M&As completed by publicly traded acquirers between 1998 and 2006. Telecommunication operators were selected from the Thomson One Banker database indexes by searching for companies within the following industries: companies with primary SIC Code 4813 (Telephone Communications except Radiotelephone), 4812 (Radiotelephone Communications) or 4842 (Cable and Other Pay Television Services). The results were limited to companies that are (at the time of the event) listed at a major US or European stock. Next, with a list of 56 potential acquirers, the M&A events which are associated with every one of these carriers were separately retrieved from the Highbeam™ Research data-

base[1]. The following search on Highbeam™ using a set of relevant search terms was performed and the earliest dates announcing the event was recorded:

- Search in article title only:

  {company name from list} AND *buy* OR *acquires* OR *bid* OR *merge* OR *takeover* OR *merger* OR *acquisition* OR *buys* OR *merges* OR *merging* OR *acquiring*

- Search in following sources:

  "newspapers" (Business Wire, Associated Press, PR Newswire, Reuters, Wallstreet Journal, Washington Post)

- Dates

  Between *Jan 1, 1998 to 31 Oct 2007*

Events that were identified using these criteria were consolidated into a master list with duplicates removed. The preliminary sample frame had 512 M&A events. Out of this, an acquisition that resulted in a controlling stake for the acquirer, i.e. greater than 50% of the stakes are chosen. This means that acquisitions giving the acquirer lower than 50% in stakes are by definition not considered as acquisitions. It is true that that in practice acquirers may de facto control the target even though they hold less than 50% of the shares. On the other hand, it is also true that owning only a minor stake, say 10% of the shares, could hardly result in a significant degree of control of the target. Determining whether or not an acquisition resulted in a controlling stake is difficult without using a great deal of insider knowledge and subjectivity. We therefore chose to apply the 50% rule outlined above, full-well acknowledging the practical limitations of our approach.

Moreover, only M&A announcements containing accurate and detailed information about date of announcement, partner and transaction value were included. Last, only those events with at least 120 days of historic stock data[2] available were selected. Moreover, to avoid possible confounding effects within the event window, a number of M&A events were selectively omitted. Excluded events are those that coincided with other major firm-specific events that might affect the stock price such as earnings alliance announcements, earnings, large investment decisions or new product introduction (McWilliams and Siegel 1997). Confounding events were identified using Highbeam™ Research functions. It displays all company news within a 4-days-range of the specific date. After meeting all these criteria, the final sample contains 88 M&A announcements of 37 telecommunication firms Once the M&A announcements

[1] HighBeam™ Research is an online research engine which sorts free, paid, and proprietary online articles and databases published in the past 20 years. It is a tool for serious business, education, and personal research - URL: http://www.highbeam.com

[2] retrievable through Yahoo! Finance or CRSP database

were isolated and the event window was defined, the "normal" (expected) returns for that window needed to be estimated. This was done by using historical stock price data (adjusted closing prices) for all acquiring companies listed in the master list. For each event 132 days of historic stock data before the event date and 10 days of stock data after the event date were downloaded through either the Center of Research on Security Prices database (CRSP) or the Yahoo! Finance database.

To measure the direction of diversification of the M&As, this study employs the SIC[3] classification as conducted by Berry (1971) and Ferris and Park (2001). Many industrial organization studies have used objective measures based on standard industrial classification (SIC) counts to capture the aspect of diversification (Ramanujam and Varadarajan 1989). The first number assigns a product to a very broad category. Each subsequent number distinguishes the product at a progressively finer level. The SIC classification has been widely used among economists to determine in which industry segments the company is operating. As all acquirers in this study are listed telecommunications companies, they all operate with the two-digit 48xx SIC-code. The acquirers strategy can be determined by comparing both the SIC codes of acquirer and the target. Telecommunications M&A occurring solely within the 48xx SIC code (i.e. both acquiring and target firms) are termed non-conglomerate mergers. M&A where the target has a SIC code other than 48xx is classified as a conglomerate merger (Ferris and Park 2001, Ramanujam and Varadarajan 1989). Conglomerate mergers include all mergers across different part of the value chain.

2.3.1 Organic Diversification Events

The data collection for relevant organic diversification events was conducted in a similar fashion as for the M&A events, however, it was somewhat less systematic and more exploratory. The reason is that in the case of M&As it is intuitively clear what constitutes a "significant" event (i.e., the acquirer purchases a significant number of that results in a voting majority). If a company enters a part of the telecom value chain organically, it is not immediately clear what criteria to apply to select only significant events, that is, events that are significant enough to make a noticeable impact on the industry structure. In this paper, we will report the impact of a few such events, which we consider intuitively as significant. These events are:

- Apples launch of the iPhone (and relatedly the signing of exclusive contract deals)
- Nokia's announcement of Ovi
- Sony-Ericsson's announcement of a major content deal with three of the four major music labels

[3] A standard industrial classification (SIC) code categorizes US business establishments based upon the type of business activity performed at its location. All fields of economic activity are included in this system including both manufacturing and nonmanufacturing operations. The system is governed by the Office of Statistical Standards.

- Google's announcement of Android
- The surpassing the 4.6 bn US$ mark in the 700MHz license auctions, which triggering the open access rules.
- Cingular Wireless, Verizon, and Sprint accounting their music download portals.

As we expected the respective announcements to be somewhat less of an immediate surprise, we chose a 21-day event window. We studied the impact of the six events on the affected telecommunications carriers' evaluation. In other words, we studied the impact of the iPhone announcement in the UK on the Telefonica (O2) valuation, as well as on the evaluation on its competitors. We did however not consider the impact on the valuation of Apple Inc. Similarly, we studied the impact of the OVI announcement on the affected telecom operators (note that most large operators are trying to offer similar services, so Ovi is a clear threat to their business expansion into the content integration market) but we did not study the impact of the OVI announcement on the Nokia share price. Beyond that, we followed the same data collection procedure as outlined in the case of the M&As

3 Empirical Results

Table 1 and Table 2 show the results from the event study of M&As and of organic diversification, respectively.

Event Types	**N**	**Z-Value for Mean CAR**	
		(-1,+1)	(-2,+2)
Complete Sample	88	2.234* (0.85%)	1.871* (0.86%)
Firm Diversification			
Non-conglomerate merger	58	1.478# (0.63%)	1.427# (0.61%)
Conglomerate merger	30	1.764* (1.29%)	1.219 (1.19%)

The symbols #,*,**, and *** denote statistical significance at the 10%, 5%, 1%% and 0.1% levels, respectively, using a 1-tail test.

Table1: Event study results for diversification through M&As

The first two columns of Table 2 present coefficients and significances for the *additive event-window abnormal returns*[4] in the respective event window (also referred to as "Mean Cumulative Abnormal Return"[5]). The abnormal returns are calculated using the market model estimated from 132 to 12 trading days prior to the event announcements. The Mean CARs (given in parentheses) represent the cumulative market model-adjusted abnormal returns over the relevant event window. The Z-statistics for the (-1,+1) and (-2,+2) event windows are based on the standardized abnormal return method according to Patell (1976).

The first row of Table 2 reports the results for the complete sample. As can be seen from the table, there is significant support for the hypothesis that M&A activities will in general have a positive impact on telecommunication firms participating in these activities. The mean CAR for both windows is approximately +0.85% and significant at the 5% level.

If we break the set of M&A events up into conglomerate mergers (i.e., mergers within a segment of the value chain) non-conglomerate mergers (i.e., diversification across segments of the value chain), we get the following results: Non-conglomerate mergers will generate positive abnormal returns. CARs of +0.63% and +0.61% are reported for both windows, respectively, both which are weakly significant at the 10% level.

The CAR for the conglomerate mergers is twice as high (+1.29%) and is significantly positive at the 5% level for the (-1,+1) window. However, no statistically significant evidence was found in the (-2,+2) window. The t-score for the paired t-test that measures the difference for both CAR means (Δ = *NonConglom.CAR - Conglom.CAR*) is negative but not significant. Hence, there is no significant evidence that conglomerate mergers show different abnormal returns than non-conglomerate mergers.

Table 2 shows the CARs related to a number of events that alter the market structure in the value chain, but which are organic in nature (i.e., not related to M&As). While these results are fairly exploratory in nature, there are a number of interesting trends to be discussed. First, overall telecommunications carriers appear to be highly threatened by the majority of changes that currently occur in the value chain. This is indicated by a highly significant negative CAR of the complete sample of events. When looking at some individual components, it appears that it is particularly the "outsiders", such as Google, Nokia, and Ericsson, with their attempts to reach out into different parts of the value chain, impose a threat to the telecom carriers by lowering their forward-looking valuation.

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[4] represents the sum of the mean cumulative abnormal returns over all event window days

[5] Diagrams for the mean cumulative abnormal returns for the complete sample were generated for the 5-, 10- and 20-day event window and can be found in the Appendix.

The carriers themselves, on the other hand, could so far able to do little to convince markets that they are capable of launching promising activities. So was neither the launch of carriers' own music download portals, nor the exclusive iPhone deals greeted with a great deal of enthusiasm. In both cases, the changes in CAR were insignificant.

Sample Type	**N**	**Z-Value for Mean CAR**
		(-10,+10)
Complete Sample	35	-0.97***
Subclasses of Events – Effects on Telco carriers		
Outsiders entering content integration markets	19	-0.47*
Telcos' own entry into content integration market	3	0.05
Google launching Android	7	-0.26*
Triggering of open access rule in spectrum auctions	3	-0.43***
Telcos' exclusive iPhone deals	5	0.14

The symbols #, *, **, and *** denote statistical significance at the 10%, 5%, 1%% and 0.1% levels, respectively, using a 2-tail test.

Table 2: Effects of Organic Diversification on Carrier Valuation

4 Discussion and Conclusion

The results of the M&A event study are consistent with previous event studies in showing that M&As in the telecommunication industry generally result in significant gains in the market values of the acquirer. Therefore, it can be concluded that the market is generally optimistic with regards to the potential of telecom carriers to add value in this industry. The highly competitive marketplace in the telecom sector means that high returns are no longer guaranteed for big telecom firms. Telecommunications networks have typically high fixed costs but comparably low marginal costs. As a result, the potential for economies of scale and scope remains enormous in this industry. All rival operators are racing to grow fast to reap those benefits. Investors may have realized that long-term growth depends on capital being diverted to productive purposes. However, reasons for cases where firms do not show positive gains af-

ter an M&A announcement can be that it is not always easy for a company to achieve synergies and to reap scale and scope. High integration costs and differences in corporate culture are reasons why M&A fail to add value. This shows investors' skepticism about the likelihood that the acquirer will be able to realize these synergies required to justify the premium paid (Selden and Colvin 2003).

Besides engaging in synergistic M&As, telecom operators have also been engaging in conglomerate mergers, diversifying into different parts of the value chain. These type of M&As were also found to be wealth-creating.

On the other hand, wherever operators tried to diversify organically, the announcements of these activities did not show any significant impact on firm valuation. It appears that forward looking markets do not put a great deal of confidence into the own innovative strengths of the carriers when it comes to business ventures outside their traditional core business. Unfortunately for the carriers, in times of reducing margins in the core business and commoditization of the traditional network operation business, it is precisely those innovative activities in vertically related markets that could help carriers regain their competitive strength. The Japanese and Korean operators provide a good illustration of this point.

At the same time telecom operators appear to be under massive threat by "outsiders", whenever these outsiders engage in activities that shift the market power in the telecom value chain. From the view of financial market, the chance of telcos being reduced to "bit-pipes" appears to be real. They most likely need to accept that they no longer act from a position of control or strength, but rather from a defensive position.

With this study we hope to have contributed to a better understanding of current fundamental changes in the telecommunications industry. It can be basis for further research on this field and might also be helpful for research on different industries that share similar structure and conditions as telecommunications.

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