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Valuation of mergers and acquisitions in the telecommunications industry: a study on diversification and firm size

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Abstract

Since the 1996 Telecommunications Act, numerous mergers and alliances (M&A) have been consummated within the telecommunications industry. These M&A involve both large and small firms in a variety of different and similar industry segments. In this industry, replete with technological uncertainty, it is useful to evaluate the impact of these activities on the market valuation of the firms involved. This study uses event analysis to examine 44 M&A events involving 89 partners in the telecommunications industry. Drawing on prior literature on diversification and firm size, the study formulates and tests hypotheses relating the impact of near and far diversification, and the size of the firm, on market valuation. The results are mostly consistent with prior work and suggest that while overall these events weight positively on market value, M&A involving near-diversification and larger firms tend to experience greater valuation effects.

Keywords: Telecommunications industry; Mergers and acquisitions; Diversification; Event study; Firm value

1. Introduction

The telecommunications industry in the US has existed in a state of chaos for the past several years. In the period leading up to the Telecommunications Act of 1996 and in the years following, there have been an unprecedented number of mergers, acquisitions, and partnerships. Companies long considered rivals have sought each other out in order to join forces to compete in the new environment. Seemingly unassociated companies are likewise joining forces. Recent stock price activity has generated countless news reports questioning the uncertainty. The apparent upheaval within the industry has left many customers, investors, and industry players unsure as to what the steady state, if any, will look like. Are these mergers and acquisitions (henceforth referred to as ''M&A'' or ''alliances'') preemptive moves in the mêlée of technology or do they generate value for the firm?

The distinction between information systems and telecommunications has become blurred as a result of divestiture, deregulation, and a flurry of new products and services offered by telecommunications vendors. E-commerce has quickened the pace for companies hoping to gain competitive advantage [18]. Organizations must assess new technologies and services quickly in order to determine their investment potential. Studies of the impact of IT investment on firm performance over the past few years have shown mixed results. Coupled with the dynamic

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environment perpetuated through E-commerce and telecommunications advancements, impacts of IT investment are difficult to assess [21].

A recent paper by Grover and Vaswani [14] examines an extensive collection of mergers, acquisitions, and partnerships in the telecommunications industry. In their research, they identified key objectives behind these alliances, among them the creation of new value through ''pure play'' and ''converging'' alliances, the control of technology, increasing market access, and gaining economies of scale or scope.

Pure play alliances involve firms having closely related products, technologies, and markets. This may result in controlling a technology or gain of economies of scale or scope. A good example of this is the merger of Qwest Communications with LCI forming the fourth largest long-distance service provider. This was intended to reduce costs, increase market share, and gain synergies of scale and scope. A second direction seeks diversity through alliances with firms offering different products, technologies, and markets. These converging alliances often result in gains in market access, development or and control of technologies, or access to information sought by one of the partnering firms. The At Home partnership with Excite gives a high-speed cable access service company, a heavy-traffic portal offering. Clearly, a powerful case can be made for benefits of alliances that involve similar partners as well as partners that are dissimilar. However, prior studies that have been conducted on diversification are not as ambivalent. They generally support the notion that if alliances involve companies that are dissimilar, they tend to have less market power and performance as compared to alliances among similar companies. However, is this valid in the telecommunications industry where value can be created by bringing the diverse ownership of technology, content, and distribution together?

Another fairly unique attribute of today's telecommunications environment is the scale of companies involved. The pervasiveness and ubiquity of the Internet and continued development of common standards provides tremendous opportunities to smaller entrepreneurial firms to contribute value. Many M&A are between these smaller firms as they attempt to build synergies and new value. How are M&A involving these smaller firms being valued?

In sum, this paper examines three questions pertaining to the telecommunications industry:

1. Does the current trend of M&A in the telecommunications industry have an impact on the value of the firms involved?
2. Is the value created contingent upon synergy (near alliance) or does today's environment value diversity (far alliance)?
3. Does the size of the firm impact influence the perceived value?

The remainder of the paper is organized as follows. Sections 3–5 discuss research on the telecommunications industry, key assessment of firm value, and studies on diversification and size, respectively. These sections are followed by the research hypotheses, method, results and discussion.

2. Alliances and the telecommunications industry

Telecommunications refers to the movement of data, voice, graphics, images, text, and video over electrical or optical media [13]. Grover and Vaswani categorized telecommunication firms into four groups: communications, distributors, content providers, and tools providers, based on the firms' primary products, their relationship with the end-consumer, and the purpose of the partnership activity that was being pursued. They developed a framework to illustrate the four types of players involved in the industry and the activities being undertaken by them. The percentages in Fig. 1 represent the activity of M&A in the telecommunications industry from 1993 to 1999 involving each of the four types of players. As shown, the majority of the activity involves the distributor (i.e., distributor–distributor, distributor–communication, and distributor–content alliances). This is indicative of the central importance of companies that have large network infrastructures as well as the importance of providing a broad range of communication services packaged by a single source. Distributor–distributor alliances, depending on the particular line of business, may be near or far alliances or both. As defined by Grover and Vaswani, distributors include such varying industries as Internet providers, long-distance providers, and television broadcasters. With

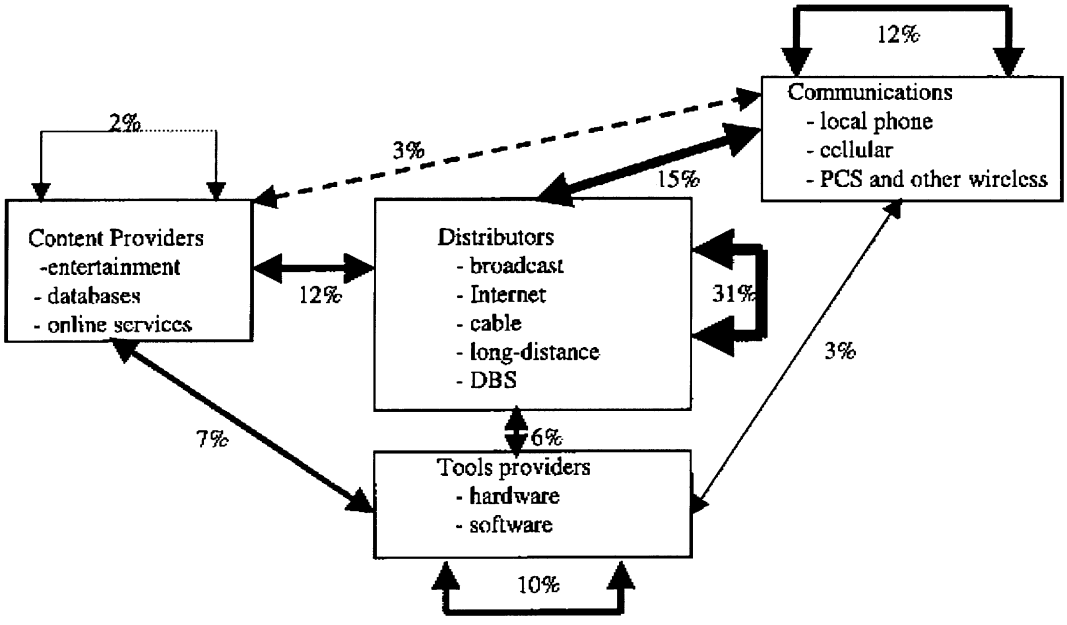

Fig. 1. Partnership patterns in the US telecommunications industry.

such a diverse group, alliances may involve highly related firms seeking near alliances, highly unrelated firms seeking far alliances, or moderately related providing expansion both in similar products, technologies, and markets while simultaneously expanding into new ones. Distributor–communications and distributor–content alliances typically involve unrelated firms in far alliances, their focus lying more on a broad diversification. Grover and Vaswani suggest that this trend will continue, leading to an industry more centralized around the powerful distributors.

Das et al. [10] examined strategic "technological" and "marketing" alliances in the telecommunications industry. Technological alliances typically involve activities upstream in the value chain such as R&D, engineering, and manufacturing. These tend to be near alliances, seeking value creation through synergy. Marketing alliances tend towards the downstream activities of sales, distribution, and customer service. Market access is a key goal in these predominately far alliances. Das et al. found that the abnormal (superior) returns from technological alliance announcements are greater than those from marketing alliance announcements highlighting the importance of the value created through technological alliances such as cost reductions attributable to the creation of economies of scale and scope, eliminating duplicate R&D efforts, reduction of transaction costs, protection of proprietary knowledge, and easing the transfer of tacit knowledge.

Similarly, Joshi et al. [17] examined the levels of diversification of 21 US-based telecommunication firms over three time periods (1988, 1990, and 1995). Categorizing the 21 firms by the level of diversification from broad to marrow, and utilizing the four strategic orientations developed by Miles and Snow [25], prospectors, defenders, analyzers, and reactors, they found that prospector firms, firms offering a broad line of products with a focus on product innovation and market expansion, had the highest level of strategic alliance activities in the years leading up to the Telecom Act. In contrast, defender firms sought low diversification for the purpose of focusing on their existing markets and products within a niche of the industry.

Collectively, these studies suggest that there are diverse M&A taking place in the telecommunications industry. While prior studies have classified these alliances in many different ways, there has been no research done to identify if these M&A are creating value for the participating firms. This paper will expand on the diversification categorization done by Joshi et al. to examine the impact on the market value

of telecommunications firms through different types of M&A activities.

3. Value of the firm and event studies

Literature in accounting and finance endorses the use of a firm's stock price (for publicly traded firms) as an appropriate representation of its market value. There have been numerous studies utilizing the power of the event study methodology in management research. The methodology provides researchers with a powerful tool to assess the linkages between managerial decisions, and actions and the resulting value created for the firm.

Management researchers have examined the creation of value for a firm as it is related to CEO succession [11], celebrity endorsements [2], and new product introductions [6]. In addition, several papers have specifically examined the impact of decisions regarding mergers [8,22], acquisitions [7,35–37], and partnerships [10,19,24].

To date, only a few studies have been conducted by information systems researchers using the event study methodology, one studying the impact of IT investment announcements [12], while the second examined the effect of E-commerce announcements by both net- and non-net-based firms [38]. A third study revisited and expanded on the earlier Dos Santos paper [15].

Employing the event study methodology, we will examine if the economic value of M&A initiatives are linked to the nature of the firms. We will categorize the nature of the activity and assess the impact on the stock price and we will look at any differences that may occur due to the nature of relatedness (diversification) between participants and the firm size.

4. The study of diversification and firm size

Mergers and acquisitions of firms are two examples of the realization of a diversification strategy that may be pursued by a company. Two modes of diversification that a firm may choose are ''internal growth'' and ''acquisition-based growth'' [31,34]. Merger and acquisition activities are a form of the latter since they involve activities designed to expand a firm through the capabilities of another firm rather than through internal development. For the purpose of this paper, we will adopt the definition of diversification used by Ramanujam and Varadarajan [31] as ''the entry of a firm or business unit into new lines of activity, either by processes of internal business development or acquisition, which entails changes in its administrative structure, systems, and other management processes''. A firm can be considered diverse if it is simultaneously active in multiple distinct businesses.

The study of diversification in the strategic management literature has a long history examining the topic from multiple angles, including why a firm pursues diversification [32,34], the choice of direction for diversification [1], the mode of diversification [20,30], and the diversity status [5,33]. One of the weaknesses of the previous studies was the lack of an objective scheme that could classify the nature of diversification. Rumelt [33] developed a qualitative classification scheme based on concepts of ''related'' and ''unrelated'' diversification in an attempt to overcome the weaknesses associated with traditional qualitative measures. His four categories were single business, dominant business, related business, and unrelated business based on the firm's specialization ratio (proportion of a firm's revenues derived from its largest single business), its related ratio (proportion of firm's revenues derived from its largest single group of related businesses), and/or its vertical ratio (proportion of a firm's revenues attributable to all of the byproducts, intermediate products, and final products of a vertically integrated sequence of manufacturing operations). This scheme has been widely used as the basis for numerous studies relating diversification to firm performance [5,29] and has also served as the basis for several event studies that have examined the relationship between a firm's relatedness of diversification and its stock performance [19,36,37].

An alternative to using a qualitative classification scheme based on Rumelt is to use either the FTC categorization or a classification based on SIC codes.[1]

[1] Standard industrial classification (SIC) codes 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 non-manufacturing operations. The system is governed by the Office of Statistical Standards. FTC categorizations are a similar industry classification system defined by the Federal Trade Commission.

Both of these measures are basically product-count measures and have been criticized for their limited richness. However, a study comparing SIC classification with Rumelt's classification found a high degree of correspondence between the two measures, supporting Rumelt's classification while also boosting the acceptability of SIC classifications [26]. However, Nathanson [28] criticized the use of SIC for both its adequacy and managerial usefulness. In order to overcome these shortcomings, studies have been done [39,40] to refine this metric using two broad diversification patterns developed in industrial organization economics research; broad spectrum diversification (BSD) and narrow spectrum diversification (NSD) [4,41].

- BSD is diversification into a different two-digit SIC industry. This measure is a count of the two-digit SIC's associated with a firm.
- NSD is diversification into a new four-digit SIC within a firm's current two-digit SIC industries.

Varadarajan and Ramanujam [40] revised the NSD as a metric of the firm, representing the mean number of active four-digit SIC categories for each two-digit, referred to as the mean narrow spectrum diversification (MNSD). Firms can now be classified into a two-by-two matrix based on BSD and MNSD counts (Fig. 2). This framework has been used most recently by Joshi et al. to categorize diversification trends within the telecommunications industry [17]. Looking at the alliance patterns of 21 US telecommunications companies over three time periods (1988, 1990, and 1995), Joshi et al. determined that the majority of the activity within the telecommunications industry resulted in movements toward cells D (very high diversification) and A (low diversification).

In addition to diversification patterns it is also believed that firm size will have an impact on the value of the firm. Most recently, Im et al. [15] examined firm size as it affects the market value of firms that have made IT investment announcements. Following Atiase's [3] argument that announcements made by larger firms are less significant to the investor than those by small firms leading to larger stock price increases the smaller the firm, Im et al. found that there is some negative correlation between stock price and firm size. Large firms will tend to have higher levels of predisclosure information disseminated that reduces the effect of the announcement of the event. Larger firms are more easily exposed to the market than small firms resulting in announcements related to small firms having higher information content. This results in a larger reaction to the announcement for smaller firms. Similar results were found by Koh and Venkatraman [19] in their study of joint ventures where they found that the smaller firm in the venture earned significantly positive abnormal returns while the abnormal returns for the larger partner were not significant. They state that it may result from the fact that the large partner's reputation may spill over to the small firm and its endorsement of the small firm as a partner may be perceived as valuable asset by the marketplace.

In similar vein, it has also been shown that the relative size of the purchased relative to that of the buyer is positively related to the value created for the buyer. From Shelton's [36] work we can see that partnership activities involving large firms will lead to

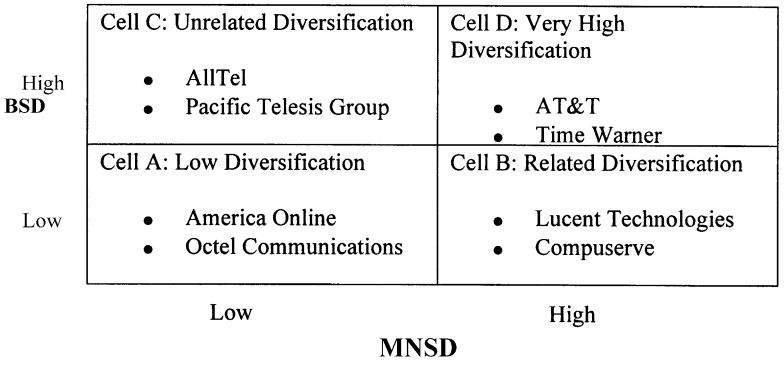

Fig. 2. A two-dimensional categorization of firm diversity (cells contain examples of firms from the telecommunications industry).

higher increases in value than would partnerships consisting of all firms. Further, in partnerships in which the firms vary in size the largest gains usually go to the smaller partners.

Overall, the studies above suggest that we can expect greater differences in market value growth for firms the choose M&A focusing on narrow diversification (MNSD) as opposed to broad (BSD). Additionally, the literature indicates the larger the firm involved in the alliance, the greater is the benefits to the other party.

5. Hypotheses

As indicated above, research in both the fields of industrial organization economics and strategic management has found that diversification activities are positively related to asset growth of a company [16]. Further, within two-digit SIC groups (MNSD) diversification tends to lead to higher performance than diversification across two-digit groups (BSD) [4,39,40]. In terms of Fig. 2, both Varadarajan [39], and Varadarajan and Ramanujam [40] found that firms that diversify across MNSD (cell B) outperform firms in cell A and cell C. In other words, related diversified firms outperformed, on an average, unrelated diversification. Arguments such as synergy, focus, competencies, and economies of scale have been forwarded as explanations of these findings.

In addition, market power has been found to be affected by diversification. Research has found that highly diversified firms do not possess the market power that less diversified firms do. Similarly, highly diversified firms will experience lower average levels of profitability than less diversified firms [27]. Under the assumption that market power is related to corporate performance, this adds support to the findings that high BSD diversification will not necessarily result in better performance.

In the uncertain technological environment that pervades the telecommunications industry, alliances span a broad spectrum. On one hand, standardization permits diversity, as does the need to integrate independent content and distribution firms. However, prior literature suggests that telecommunication firms that seek diversification within the industries with which they are already familiar should experience higher abnormal stock returns than those firms that venture into uncharted territories. We argue for the latter case and propose the following hypotheses:

(H1) Merger and acquisition activities in the US telecommunications industry will have a positive impact on the market value of the firm.
(H2) The impact on the market value of the firm will be greatest for firms that pursue merger and acquisition activities that expand their MNSD portfolio more than their BSD portfolio.

As we have discussed earlier, firm size is expected to impact the value of the firm in M&A activities. From Atiase's [3] work we expect that smaller firms will experience larger gains in market value compared with larger firms. Also, the findings from Shelton's [36] study we can expect that M&A activities that involve only large firms will outperform those involving only small firms. However, in activities in which the firms vary in size relative to each other it will be the smaller firm that experiences the larger impact. From these statements we can formulate our third hypothesis.

(H3a) When telecommunications merger and acquisitions are announced, the market value increase will be negatively related to firm size (i.e., the value change will be higher for smaller firms).
(H3b) Market value increase will be more positive for activities in which all firms are large than in partnerships in which all firms are small.
(H3c) In activities involving firms of different size, market value increases will be more positive for the smaller partner firms within the M&A event.

6. Methodology

In order to conduct the study, data was collected on firms participating in M&A activities in the telecommunications industry. The companies selected for this study were all categorized into one of the aforementioned industry groups; content providers, communications, distributors, and tools providers. In addition, a careful assessment was made on whether the purpose of the activity fell into the domain of telecommunications, as defined earlier. For example, an entertainment

provider (content) might partner with a software producer (tools) to create and market an Internet-based video game based on a product of the entertainment company. This would not meet the criteria. In contrast, M&A involving distributors and communications firms automatically qualified. However, with tool-to-tool, content-to-content, and content-to-tool activities all were carefully evaluated before selection.

M&A events were collected from major news services including PR Newswire, Business Newswire, and other major daily news outlets. The online search features of Lexis/Nexis were used to identify the events occurring between the date of enactment of the Telecommunications Act of 1996, 8 February 1996, and 31 December 1998. The date of the event was defined as the first mention of the activity whether it is a formal announcement made by the firms or if it is an unofficial announcement.[2] Following event studies in the finance and accounting literature, a 2-day event window was used, including the event date and the day prior to it. The 2-day event period was chosen to accommodate the uncertainty regarding when information is released prior to its appearance in the print media. The returns during the event period are accumulated to calculate the cumulative abnormal returns (CAR) for each stock. Data of 200 daily returns for each participant prior to the event window was collected from the Center for Research in Security Prices (CRSP) and used as the estimation period representing average normal return. An estimation period of 200 days was chosen based on prior studies [12,15]. The timeline in Fig. 3 illustrates the estimation and event periods used for the data collection.

Since the primary focus was on M&A activity, events involving partnerships and joint ventures were not selected. All companies involved in the event were listed on one of the major securities exchanges (AMEX, NYSE, NASDAQ) and were in the COMPUSTAT and CRSP databases. In addition, events in which confounding factors such as news regarding dividends, earnings, other partnership activities, or the release of other important firm-specific information

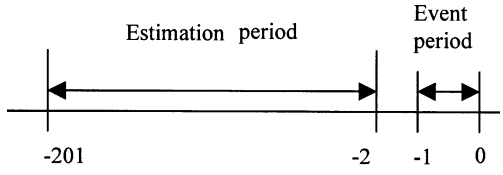

Fig. 3. Estimation and event period.

during the announcement period were eliminated from the sample. The resulting sample consists of 44 M&A events representing 89 participants.

Total assets, total number of employees, and total sales were collected from COMPUSTAT for each participant firm based on the fiscal year-end data preceding the event. This data was divided into two groups of equal size to distinguish large and small firms. The overall size coding (small or large) was calculated for each firm based on the three size variables. Firms were coded as a given size when they were coded as that size on at least two of the three size variables. To test (H3b) the firms were then coded according to their relationship in size as compared to the other firms in each event. Lastly, dividing those events with mixed sizes of firms into two groups, one consisting of the firms that were the smaller firms in the event and the other containing the larger firms, allowed testing of (H3c).

In addition to coding for firm size, it was necessary to code each company according to changes in MNSD and BSD. This was done by determining each company's MNSD and BSD prior to the merger/acquisition. We then combined this with the SIC codes of the other firms in the event to calculate, for each company, the new BSD and MNSD. A direction of movement was then coded in accordance with Fig. 4. Firms are coded based on the change in their diversification pattern. Firms that increase predominately along the MNSD axis are coded as 1, firms that increase predominately along the BSD axis are coded as 2, while firms whose diversification pattern remains unchanged are coded as 3.[3] As an example, a press release of 17 July 1997 announced that Lucent Technologies intended to acquire Octel Communications Corp. Lucent Technologies designs, builds and delivers a wide range of public and private networks,

[2] For many events the formal announcement often occurs a considerable length of time after the unofficial rumors begin making the formal announcement anti-climatic.

[3] Other states can be represented in Fig. 3 for divestment patterns. These are not shown.

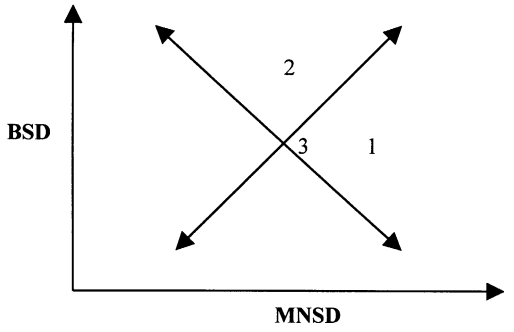

Fig. 4. Movement (BSD + MNSD with diagonal).

communications systems and software, consumer and business telephone systems and microelectronics components (SIC codes 3661 and 3679). Its acquisition of Octel would extend its business into other communications industries such as high-end voice mail and messaging technology (SIC code 4822). Therefore, the acquisition predominantly increased Lucent's BSD. Contrarily, the acquisition extended Octel's business into the electronic components industry (SIC 3679), which mainly increased its MNSD (from 3661 and 4822 to 3661, 3679 and 4822).

The computations for abnormal returns follow prior studies in accounting and finance. The calculations used are shown in Appendix A. Using the *Z*-statistic we test the significance of the abnormal returns. A significant result indicates an impact of M&A announcements on the market value of a firm.

7. Results

Average CAR were calculated for the full sample of firms to test our hypotheses. Of the 89 firms in our sample, one was eliminated from the analysis because of too many days with zero returns making the calculation of abnormal returns inaccurate. The results are shown in Table 1. As can be seen in the table, there was significant support for the first hypothesis, that M&A activities will have a positive impact on US telecommunication firms participating in these activities. In addition, the results also clearly suggest that firms pursuing M&A activities that extend their MNSD diversification more than their BSD diversification will experience greater market value increases (H2). Also, the results also show support for two of the hypotheses regarding size effect (H3b) and (H3c). However, (H3a) was not supported, as both large and small firm M&A activities seemed to have comparable increases in valuation.

Table 1
CAR for telecommunication event announcements

	N	Average CAR[a]	*Z*-value
Full sample (H1)	88	0.335	6.727****
Movement effect (H2)			
Predominant MNSD	16	0.0912	8.987****
Predominant BSD	56	0.0198	3.072***
No change	16	0.0239	2.017**
Size effects (H3a)			
Large	42	0.0267	4.657****
Small	44	0.0393	4.756****
Event size effects (H3b)			
All large firms	27	0.0468	6.571****
All small firms	30	0.00023	0.022
Mixed sizes event (H3c)			
Smaller firms	13	0.1332	10.234****
Larger firms	14	−0.0083	−0.816

[a] Average CAR (%) over event period.
** $p < 0.05$.
*** $p < 0.005$.
**** $p < 0.0001$.

8. Discussion

There is evidence that during the period of the study, announcements of telecommunication mergers and acquisitions activities did result in significant increases in the market values of the affected firms. This suggests that the market in general views these activities favorably. The findings are particularly interesting in light of prior events studies in the IT area, none of which found significant movement in stock prices based on IT announcements [12,15]. Therefore, we can conclude that investors are optimistic about the potential of firms to add value in this industry after the 1996 Telecommunications Act reduced regulatory interventions.[4]

It can be seen that firms that participated in M&A that increased their MNSD greater than their BSD did experience significantly greater market value increases. The acquisition of Octel by Lucent gives us an example of this difference. Two days before the event date, the stock price of Lucent Technologies (high BSD increase) was $82.75. It gained $3.30, a 4% increase, on the event date. In the same period, Octel's (high MNSD increase) stock price rose $6.6875, from $23.4375 to $30.125 for a 28.5% increase. As expected, those firms that were involved in activities with companies in the same industry resulting in no change in the firm's diversification, although significantly increasing value, saw the smallest gains in market value compared with the other firms in the sample.

In more pragmatic terms, these results suggest that while all M&A activities in this industry are valued, those involving firms that can demonstrate visible synergy in terms of technology, markets, and markets are valued more. For instance, the alliance between GTE and LDDS (MNSD) allows GTE to resell LDDS long-distance and offer national and international long-distance services in all 28 states where it is a local exchange carrier. Similarly, the alliance between BellSouth and Quest Communication provides Bell South access to lucrative new long-distance markets. It is our contention that MNSD M&A in this industry offer visible benefits that have lower uncertainty than BSD alliances. For instance, the merger of a content company (Disney) with an unrelated distribution company (ABC), a BSD, can close the loop in terms of distribution of Disney's content. However, there is some uncertainty regarding the ''lock-in'' relationship between the two parties, in an environment of open market-based structures. Similarly, Microsoft's acquisition of Web TV Networks (a BSD), gives Microsoft access to innovative technology that allows consumers to surf the Internet, and send and receive email via a standard television set. However, the control of this technology is subject to uncertainties of market receptiveness and the new technology paradigm.

Contrary to our hypothesis, M&A involving larger firms and those involving smaller firms yielded similar increases in valuation. While this could be an artifact of the sample used, there are other plausible explanations. Specific to an industry, which is replete with technological uncertainty, key attributes driving market valuation are disclosure, capitalization, and innovation. Smaller firms, as discussed earlier, have limited predisclosure information, and therefore the event is significant relative to its size. Further, smaller firms through unique and innovative new technologies can respond to market opportunities by creating new innovations. The number of success stories in the Internet age spawning from Silicon Valley is testimony to the innovativeness of small entrepreneurial firms. M&A involving these firms are valued in this market. However, M&A involving a large firm can spawn new innovation due to the higher capitalization of the firm (and therefore greater resources) to take advantage of market opportunities. Therefore, as the results indicate, on an average, the direction of the market response is similar. However, among these alliances, there are differential impacts that are discussed below, and provide an explanation of the averaging effect.

For instance, events consisting of all large firms do significantly outperform those consisting of all small firms (which did not experience any significant increase). This indicates that despite the lack of predisclosure effects, the marketplace does not value M&A involving only small firms. The lack of capitalization of the small firm alliances, as well as the uncertainty regarding their ability to take advantage of new innovation, may be nullifying the predisclosure

[4] More recently, after the period observed in the study, the valuation for telecommunication stocks took a marked downturn. We suspect that this is a systematic, and perhaps short-term response to high valuations.

effect. For instance, on the date when America Online announced its acquisition of CompuServe (9 August 1997), its stock price increased 36.4%, from $56.25 to $76.625 over a 50-day period. In the same time span, CompuServe's stock price increased by $2.875 (an increase of 27.5%), from $10.4375 to $13.3125. We can contrast this with the announcement of an event involving two small firms. Two days prior to the event, Primus Telecommunications Group's stock price was $19.875. The event announcement resulted in a 4.4% increase to $20.75 while stock prices of its counterpart, Trescom, rose $0.375, a 4% gain.

In contrast, the strong support for (H3c) indicates that small firms show significant increases in valuation when merging with larger firms. Here, the lack of predisclosure information, makes this a extremely significant event for the smaller firm. Also, the capitalization advantage of the larger firm (and its reputation) is viewed as a property of the smaller firm. In other words, the smaller firm has its innovation or asset, the predisclosure advantage, as well as the resources to capitalize on it. As an example, we can look at the resulting stock prices of MFS Communications and its acquired company, UUNet Technologies. The event announcement occurred on 30 April 1996. Two days prior to the event, the stock price of MFS (classified as the larger firm in this activity) was $34.50. On the event date, its stock went up $0.1875, a 0.5% increase. The stock prices of its counterpart, UUNet (classified as the smaller firm), gained $14 for a 31% gain, from $44.75 to $58.75.

9. Conclusion

This work has examined the response of market price to announcements of telecommunication-related mergers and acquisitions. In addition to the effect on price, we also examined the impact of diversification patterns and firm size on the market value gains. Support was found for four of the five hypotheses put forward in this paper. We can conclude from our findings that, contrary to studies performed on IT-related announcements in the past, the announcements of telecommunications activities do impact the market value of the firm. Our study consisted of activities that have occurred since the Telecommunications Act of 1996 and have occurred during a period of significant growth on the stock market. Further work would be required to assess if these activities differ from the overall performance of M&A activities during this period.

Besides the positive market valuation of M&A in the telecommunications industry, four other findings can be summarized:

1. M&A involving partners that are in related business outperform those involving partners in unrelated businesses.
2. Market value increases for larger firms are similar to those experienced by smaller firms in M&A activities.
3. Alliances between smaller firms are not valued, while alliances between larger firms are.
4. If the alliance involves a larger and a smaller firm, the smaller firm reaps the valuation benefit far more than the larger firm.

We believe that this work adds richness to our understanding of M&A activities, specifically in an arena pervaded by technological uncertainty. Despite arguments that can be made both for near and far diversification, the results are fairly consistent with prior expectations. A possible implication of this, support the current trend of distributor–distributor activities in the telecommunications industry by showing that firms that seek to expand within their current two-digit SIC industry outperform those that seek diversification primarily into new SIC groups. Our findings would suggest that M&A activities far beyond the current focus of a firm's business are not as attractive in terms of market valuation. However, we would suggest that the reasons for this are more to do with the uncertainty related to products and services emerging from unrelated diversification. In this changing technological and business paradigm, the results should not dissuade dissimilar diversification, but reinforce a well-known concept of ''high risk, high return''. It is also apparent that no matter what the alliance is, the participating firms will see market value increases.

Firm size also plays a role in market value gains following an M&A announcement. This might suggest that it is best for large firms pursuing M&A, to pursue these activities with firms of equal or larger size. We can also suggest from our findings that small firms should seek activities that pair them up with firms

larger than themselves to experience larger market gains.

It is important to note that further work is needed before any prescriptions can be made. Larger sample sizes and the use of alternative measures of diversification are needed to further validate the results. Also, as the activities in this industry continue to promulgate, new products, services, and industries will be spawned. Many of these cannot be envisioned yet. It is important to continue evaluating activities and their value in order to better understand the evolution of this critical arena.

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Appendix A. The market model and analysis of abnormal returns

Calculation of the impact of an event on a firm requires the calculation of what the price of the firm's stock would have been if there had been no event. To do this, and to control for overall market effects, we regress the price of the stock against a market index. We need to calculate both the abnormal return for stock during the event window and the normal return. The market model is a statistical model that relates returns for a given security to the return of the market portfolio. For this study, we have used the market model and abnormal returns analysis as presented by MacKinlay [23].

For any firm j on day t the market model is expressed as

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt}$$

where

$$E(\varepsilon_{jt}) = 0, \qquad \mathrm{var}(\varepsilon_{jt}) = \sigma^2_{\varepsilon_j} \tag{A.1}$$

Given the market model estimates we can then calculate the abnormal return for of firm j on day t. This is defined as

$$\mathrm{AR}_{jt} = R_{jt} - (\alpha_j + \beta_j R_{mt}) \tag{A.2}$$

where R_{jt} is the actual return for the jth firm for time period t, R_{mt} the actual return for the market for time period t (equally weighted market index), α_j the intercept term, β_j the systematic risk of the jth firm, and ε_{jt} the error term, with $E\{\varepsilon_{it}\} = 0$.

Two market indexes could be chosen for R_{mt}: equally weighted and value-weighted. The equally weighted index was chosen as it is more likely to detect abnormal returns due to the higher degree of correlation between the equally weighted index and the returns This higher level of precision results in more easily detectable abnormal returns [9]. Our results may change if value-weighted index is used.

When using a multiple period event window it is necessary to aggregate abnormal returns across time. The cumulative abnormal return (CAR) is calculated first for each firm:

$$\mathrm{CAR}_j(t_1, t_2) = \sum_{t=t_1}^{t} \mathrm{AR}_{jt} \tag{A.3}$$

Asymptotically the variance of CAR for firm j can be expressed as

$$\sigma^2_j(t_1, t_2) = (t_2 - t_2 + 1)\sigma^2_{\varepsilon_j} \tag{A.4}$$

As tests with one event are unlikely to be useful we must then aggregate CAR across firms to obtain average abnormal returns:

$$\mathrm{ACAR}(t_1, t_2) = \frac{1}{n}\sum_{j=1}^{n} \mathrm{CAR}_j(t_1, t_2) \tag{A.5}$$

where n is the number of firms included in the sample. This aggregation assumes that there is not any overlap in the event windows of the firms included in the aggregation, that there is no clustering.

The variance of the average CAR returns for all firms can be expressed as the follows:

$$\mathrm{var}(\mathrm{ACAR}(t_1, t_2)) = \frac{1}{n^2}\sum_{j=1}^{n} \sigma^2_j(t_1, t_2) \tag{A.6}$$

Again we are assuming no clustering.

As with CAR, we are assuming that ACAR is asymptotically normally distributed. Finally, we can test the statistical significance of the average effect of an announcement event on the market value of firms but calculating the *Z*-statistic as

$$Z = \frac{\mathrm{ACAR}(t_1, t_2)}{\mathrm{var}(\mathrm{ACAR}(t_1, t_2))^{0.5}} \quad \text{(A.7)}$$

A significant test of abnormal returns based on the *Z*-statistic confirm the impact of telecommunications-based M&A announcements on the market value of firms.

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