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Value creation in evolving information industries: the effects of U.S. mergers

Louis Rhéaume

A thesis

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of

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ABSTRACT

VALUE CREATION IN EVOLVING INFORMATION INDUSTRIES: THE EFFECTS OF U.S. MERGERS

Louis Rhéaume

This study investigates two main issues: (1) to what extent the level of relatedness among targets and bidders in the information industries affect the shareholder value of the bidders, and (2) what is the performance of related versus unrelated mergers in the information industries compared to what has been documented in the literature. We study the impact of diversification, whether related or not, in uncertain environments. We report interesting patterns by focussing on technologically converging industries for the three sectors comprising the information industries: information content, information appliances and information highways. Using a sample of 344 U.S. mergers for the period 1993 to 1997, we examine the stock market's response to these mergers in the information industries using the event study methodology. Thus, a short-term and long-term event study is undertaken to analyze the abnormal returns associated with those mergers. Inconsistent with the general literature, which found slightly negative or zero abnormal returns for the bidders in the short-term, we found some patterns of positive returns. However, consistent with prior research on the performance of related versus unrelated mergers, we found mixed results. Cross-sectional analysis shows that research and development expenditures on total assets (measure of technological uncertainty) are

significantly negatively related in the short-run with abnormal returns, while they are positively related in the long-run with abnormal returns.

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I- Introduction

The field of mergers and acquisition has been extensively analyzed in corporate finance. The 1990's represent the fourth important takeover wave of this century (Mitchell & Mulherin, 1996; Katz et al., 1997). However, this time around high technology seems to play a substantial role in this resurgent movement. Particularly, at the heart of the change in the industrial dynamics is the rapid technological change that brings firms, which were once distinct, in direct competition, or sometimes in partnerships (Taylor and Lewis, 1998). According to Jensen (1995), mergers and acquisition are "a response to new technologies or market conditions which require strategic change in a company's direction or use of resources". This perspective has not been well covered in the literature.

New media such as multimedia have speeded up the merging of the various cultural branches – film and video, television and radio programming, publishing and sound recording – into a single industry. The entertainment and learning industries have integrated into a gigantic whole. The usual definitions of these industries is evolving. New challenges appear for government and private organizations (Campbell, 1994).

According to the World Bank Group, the three major drivers of the information revolution are the significant decline in the price of transmitting the information, the increase in the power of computing and the shift from analog to digital

information technologies which has joined the telecommunications and computing industries and merged market segments of the information industries.

Appendix I shows the information industries within the multimedia landscape (McKinsey Quarterly, 1994). According to the International Engineering Consortium (1999), the information industries today is in the early stage of "a momentous transformation"[1].

The computer industry and the disk-storage sector have experienced a similar transformation (Yoffie, 1997). Major players dominated vertical markets, like Digital in the mainframe business with the microchip, the operating system and most of the hardware (proprietary systems). Markets dynamics changed with a disintermediation of the value chain: IBM dominating the PC, Microsoft in the operating system and Intel in the microprocessor (open architecture).

A similar process is occurring in "information industries", which represent about a sixth of the U.S. economy[2]. Historically, the industries have been organized based on the "information form": firms within an information industry tended to focus on business opportunities related to a single form of information, such as voice, text, image, audio/video or data. Since digital electronics is fast becoming

[1] Mitchell & Mulherin (1996) reports the most active industries in M&A activities during the period 1993-94. It appears that from the seven most active industries, three: Broadcasting, Communications, Leisure & Entertainment, can be part of what some call the "Content industries" (Industry Canada, 1997; McKinsey Quarterly, 1994) or the "New Information Industry" (IEEE Engineering, 1999).

[2] A similar degree of importance is found in Europe in 1994. Information industries realised a turnover estimated at about ECU 150 billion and provided direct employment to over two million in Europe (Information Market Observatory, 1995).

the dominant technology for almost every existing information-based business a realignment of the broader information industry appears inevitable (International Engineering Consortium, 1999). One has only to think of AOL and Time Warner[3] or Seagram and Vivendi mergers examples.

It appears that old information industries defined by technology: Publishing, Photography, Broadcasting, Communications, Leisure, Entertainment, Computer, could be categorized into three new sectors: Information content (create & collect), Information appliances (display devices & store) and Information highways (process, applications & distribution).

Furthermore, today's computer hardware industry could be simply relegated to an important but restricted role as a provider of memory and processing capabilities to each of the "functionally defined information industries" (International Engineering Consortium, 1999; see Appendix II for more details.)

Researchers both in finance and strategy have analysed the differences in the degree of relationship between firms involved in mergers and acquisitions. The literature of diversification via M&A contains many studies on the analysis of the performance of related versus unrelated diversification transactions. In a portfolio perspective in finance, we can say that the diversification which occurs

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[3] On January 10, 2000 America Online and Time Warner announced a strategic merger of equals to create the world's first fully integrated media and communications company in an all-stock combination valued at $350 billion (Time Warner, 2000).

when a firm is buying a similar firm in the same industry can be explained by the concept of portfolio diversification. For instance, when portfolio managers who manage a communication mutual fund decide to buy another stock, another cable firm in their portfolios, there is a small degree of portfolio diversification: it is similar to the concept of highly related diversification, widely documented in strategy. However, in this case the diversification is not as high as a transaction categorized as unrelated, which could involve buying a firm or a stock in a completely different industry from the bidder's. According to Rumelt (1981) when a firm begins to engage in businesses in more than one market or industry and when less than 70 percent of a firm's revenues comes from a single line of business and these multiple lines of business are linked in some ways, the firm has implemented a strategy of related diversification. When a firm is engaged in different businesses (and it exists is no linkages among these businesses) and less than 70 percent of a firm's revenues comes from a single line of business, then that firm is pursuing a strategy of unrelated diversification. Among the studies on diversification via M&A, there are some on the performance of conglomerates that tend to show generally bad results for shareholders, over the long-run (Barney, 1996). On the other hand, studies on the degree of relatedness have found that related diversification tends to largely outperform unrelated diversification (Barney, 1996). Most of the research suggests that firms that have implemented a valuable dominant-business, related-linked[4] diversification

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[4] It occurs when less than 70 percent of the revenues of a firm comes from a single business, and different businesses of the firm share only a few links and common attributes or different links and common attributes (Barney, 1996)

strategy outperform firms that have implemented only a single-business or an unrelated diversification strategy (Barney, 1996).

For many organizations, internal growth is not sufficient to sustain competitive advantages against competition. For instance, Busija et al. (1997) report that exclusive reliance on a single mode of diversification (internal development or acquisition) can restrict performance. While technological developments have in the past resulted in the proliferation of new industries, it appears that today the process is reversing. Thus, new technologies produce overlapping functions and blur traditional demarcations between sectors.

The battle among telecommunication and cable companies and similarly, data over voice are among the most popular examples. Other confrontations like web publishing against print publishing have already started. The convergence of the Internet with traditional media has also prompted new associations: AT&T and Excite@home, AOL with Time Warner. Some have depicted these affiliations as lateral moves in order to restrict future overlapping activities. For instance, merging activities which are in direct competition and are serving the same customers. An example could be the battle of cable with phone companies to offer acces to information over their networks, which could be the same overlapping activities.

Thus, AOL is primarily an "information content" provider with Netscape, web sites and chat rooms. However, it contains an important part of "highways" since it provides Internet access. This company is buying Time Warner (a content owner) which is primarily engaged in publishing. Time Warner has a major business too in cable which represent the "Information highways" part of the company. So, with this merger AOL subscribers will gain access to the vast supply of content from Time Warner[5]. By merging the world's leading Internet and media companies, AOL-Time Warner will be uniquely positioned to speed the development of the interactive medium and the growth of all its businesses.

The new company will provide an important new broadband distribution platform for America Online's interactive services and drive subscriber growth through cross-marketing with Time Warner's pre-eminent brands. Some observers refer to this strategic transaction as the end of cable TV's dominance in the entertainment industries.

Furthermore, this transaction could be defined as a high flying stock (AOL), which is using its lofty stock valuation to buy real cash flow (from Time Warner): "a tactic that will allow other high-valuation Internet plays to legitimize their businesses" (Lewis, 2000). Others specialists call it the formation of one of the

[5] (i.e. Time magazine, Fortune, People, Sports Illustrated, CNN, HBO, Warner Brothers, Pokemon, etc.)

seven media "kereitsus[6]". In Canada a similar deal was carried out in 1994 with Rogers Communications buying Maclean Hunter (Fraser, 2000).

In Europe, content packagers (broadcasters, print publishers and electronic publishers) are responding to the new challenges by integrating content production with distribution (Information Market Observatory, 1994). Mergers and acquisitions are driven by varying motivations, such as control over expertise (in terms of personnel, experience, markets, customers, technology, IPRs), removal of competitors, financial investment and conglomerate policies.

According to the Information Market Observatory (1994), film, music and television are usually the hunted rather than the hunters, in the mergers and acquisition world. Network operators and large media conglomerates have identified motion pictures, music and television programs as forming the bulk of the valuable content that will make or break participants in the future multimedia world.

According to Galbraith et al. (1986), unrelated diversification is most valuable when implemented in uncertain settings. On the other hand, Nguyen and Devinney (1990) argue that technological related activities do generate economies of scope and thus, related diversification is valuable when dealing with technology issues.

[6] "A kereitsu is a Japanese term that describes a confederation of firms that may come from markedly different industries but share enough common denominators that they formally or informally participate in

It would be interesting to analyze if these economies of scope are materializing in the long-run, even in uncertain environments like the one of information industries where fast technological development are often mentioned as the primary reasons for doing M&A. Moreover, the recent boom in high-tech M&A has not been well analyzed, probably due to its newness[7].

It appears that some corporate titans have clearly adopted a related diversification strategy[8] (weakly-related) in M&A (Microsoft, AT&T, Canon) in order to cope with turbulent technological change, instability in user tastes and unfortunate "technological bets" (the probability to join a technology which will not be the standard of the industry). Since the environment of information industries is intensely competitive, above-average profitability seems to depend largely on superior execution and the ability to manage successfully through significant technology discontinuities.

The unusual intensity in high-tech M&A can be explained partly by the movement of convergence due to technological innovations, regulation (i.e. authorization of the HDTV standard, deregulation of local telecommunications in the G7) and global competition. The definitions of what constitutes information and entertainment are evolving (see Appendix II for details).

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the same strategic vision" (Akin, 2000)

[7] Since 1993, the value of high-tech deals has surpassed consecutively Banking and Oil & Gas as the most active industry involved in M&A (Forbes, August 1999).

In the information society, "content" is expected to play an increasingly important role. With the proliferation of channels: T.V channels with satellite, MMDS[9], digital cable, Internet channels; digital radio, digital TV, wireless devices like PCS offering Internet browsers or wire devices such as WebTV, the exponential expansion of bandwidth tend to accentuate the demand for some "content". The new channels necessitate content, whether in the form of text, video or image in order to inform, educate, or entertain. In fact anything that can be digitized and satisfies a specific need will probably find its place in the new information industry (International Engineering Consortium, 1999).

Appendix II, figure I displays the actual information industries organized according to traditional technology and shows where the sectors are evolving (International Engineering Consortium, 1999). Among the most fiercely competitive battlegrounds of the "multimedia landscape" (McKinsey, 1994), content creation represents the most fragmented. It encompasses businesses that collect and analyze information for business users, as well as providers of entertainment and information content that target consumers. They do compete with each other for their customers' time and money.

The media have often suggested that those who hold content rights will be the winners in today's evolving environment. It could be particularly interesting to

[8] See Appendix III for an enumeration of the M&A activities of Microsoft in the past years : an extreme example of related and unrelated diversification primarily with investments.

analyze the performance of the players involved at the beginning of the content value chain (content creators and content packagers) compared to the others players (traditional distributors, digital networks, gateway and personal devices) in term of M&A activities. Thus, it could be interesting to analyze whether content owners are really becoming the "kings" and are earning above-normal profits.

This paper is organized in the following way. In part II we review the literature on diversification with a focus on technological considerations. In part III we enumerate our hypotheses and predictions. Next, in part IV we provide a description of our sample and in part V we do our testing and show our results. In part VI we interpret the results. Finally, we conclude in part VII.

[9] Television by micro-waves.

II- Review of literature

Corporate diversification has been a popular topic both in finance and in management. For the organization, the choice between build (internal growth) and buy (mergers and acquisition) is still very relevant in these years of rapid technological changes. The literature reports few cases where both options are analyzed at the same time. On the other hand, several studies have focused on the impact of mergers and acquisitions on the short-term or long-term performance of firms. It appears that the debate over related diversification versus unrelated diversification has produced mixed results when analyzing the broad picture of M&A. However, in this study we focus on the uncertain environment of the "information industries value chain". We try to extract patterns resulting from these fast evolving industries. We first enumerate the main factors that may affect value creation when mergers and acquisitions are involved.

2.1 Diversification

According to Rumelt (1982) there are 4 broad types of diversification: single, dominant, related, or unrelated businesses. Appendix V explains in detail Rumelt's categories. While he found that firms diversifying perform better than others, he cannot explain why so many related constrained[10] firms have changed their strategies and moved into unrelated business postures. It appears that high

[10] When less than 70 percent of firm revenues comes from a single business, and different businesses share numerous links and common attributes.

performing related-constrained firms were operating in high-growth concentrated industries.

Datta et al. (1991) provides an extensive and integrative theoretical framework to review existing empirical research on the diversification-performance relationship. Appendix VI shows this interesting theoretical framework. The authors pinpoint the importance of industry structure factors: concentration, barriers to entry, capital intensity, growth and technological change, all influencing the performance of firms in their choice of diversification mode (with organizational factors, too).

These factors are moderating variables between diversification modes and performance of firms. However, the authors add that the effects of industry as well as organizational factors have remained largely unexplored. The authors conclude: "it should be interesting to explore whether a strategy of related or unrelated diversification is likely to be more beneficial under certain industry conditions versus others". Lemelin (1982) has shown that industry characteristics are definitely relevant.

Busija et al. (1997) found that exclusive reliance on a single mode (internal development or acquisition) could restrict performance. Thus, internal development as a mode of entry should complement the use of related-constrained strategies, while acquisition as a mode of entry should complement

the use of unrelated strategies. Moreover, highly related firms performed better with mixed development, and unrelated firms performed better with acquisitive development.

2.1.1 Relatedness in diversification

Yip (1982) studied the dilemma of diversification entry. He found that the choice between the two entry modes is well explained by measures of barriers and relatedness. Thus, higher barriers are more likely to be associated with acquisition entry. Greater relatedness is more likely to be associated with direct entry. He developed this model, where Yd/a represents the probability of direct versus acquisition entry.

Yd/a = *f* (market structure and incumbent characteristics,
Entrant parent characteristics
Entrant relatedness to entered markets,
Entrant competitiveness
Entrant motivation.)

The results clearly show that the choice is affected by market structure and entrant characteristics. All the variables were significant and entrant parent characteristics were the most significant variable. Surprisingly, relatedness between entrant and parent was the least important variable.

For Christensen and Montgomery (1981), Rumelt's category scheme can perhaps best be viewed as a means for distinguishing a few distinct groups from others firms in general. They argue that

> "firms located in markets which constrain their growth or profitability are the most likely candidates for diversification. Firms or businesses in – low opportunity - markets are likely to find a similar lack of opportunity in markets, which they could enter through constrained diversification. Therefore, they are more likely to pursue unrelated diversification." pp.338

Grant and Jammine (1988) found that diversified firms outperformed specialized firms. In their study, there was no evidence that related diversification was more successful than unrelated using Rumelt and Wrigley strategic categories. However, firm size was a very significant variable between strategic categories.

Along the same line of argument, Michel and Shaked (1984) conclude that firms diversifying into unrelated areas "have been able to generate superior performance over those with predominantly related businesses ". According to the authors, the question of whether to diversify in related or unrelated business is from the firm's perpective based on two conflicting considerations. Thus, diversifying into a related field is

> "likely to yield more synergism than pure conglomeration or highly unrelated diversification. The management is familiar with the markets or technology of the related business, and thus, it is expected that merging and employing similar distribution channels or production technology will result in incremental value ... However, because the earnings streams resulting from related diversification are subtantially correlated (e.g. earlier than expected technological obsolescence of a similar production technology), it is unlikely that total risk will be significantly reduced."

Thus, related diversification is likely to yield potential synergy, but has little total risk reduction and has an uncertain impact on the level of systematic risk. In contrast, while unrelated diversification is not likely to yield potential synergy and has little effect on the weighted average systematic risk, it has the potential to

reduce total risk. These results are the opposite of Rumelt's findings. Among plausible explanations, Michel and Shaked (1984) used different performance measures. They based their investigation on different time periods and relied on market-risk performance measures instead of accounting measures.

In the same view, Gailbraith et al. (1986) found that unrelated diversification seems valuable in uncertain settings. They present empirical evidence that unrelated diversification can represent a hedging strategy against the technological surprises that occur in intensive research and development industries. Like Michel and Shaked (1984), they took risk as a criterion " in conjuction " with return in evaluating diversification strategy. The authors emphasized that the technological base of any firm's product, along with its production and marketing capacity, can be rendered obsolete by a competitor's discovery, a "form of technological mugging".

Firms pursuing synergy, with related diversification, can create common points of vulnerability to technological threat. Thus, diversification away from this source of potential technological mugging provides an obvious and reasonable hedge against such threat. Therefore, it appears that firms may use unrelated diversification strategies as a mechanism for hedging against the possible technological mugging effect in industries associated with high research and development effort.

The pecking order view argues that firms undertake conglomerate mergers when managers have concluded that related mergers are not attractive and that their skills can best be applied in an unrelated field (Norton, 1993).

On another perpective, Nguyen and Devinney (1990) argue that technology-related diversification[11] is valuable because of the economies of scope that are generated result in greater firm performance. Berger and Ofek (1995) studied the effects of diversification on firm value by estimating the value of diversified firm's segments as if they were operated as separate firms. By imputing standalone values for individual business segments they found a 13% to 15% average value loss from diversification during the period 1986-1991. The value loss was smaller when segments of the diversified firm were in the same 2-digit SIC code. Thus, it means that closely related diversification was less value destructive than unrelated diversification. However, stand-alone firms are more profitable according to the authors.

Lubatkin & O'Neill (1987) report that related mergers are associated with a significant decline in systematic and total risk. They argue that observers should make a clear distinction between corporate strategy and portfolio strategy and suggest that corporate managers should focus their attention on building competitive advantages in each participating market rather than pursue new markets for the sole purpose of hedging corporate bets.

Balakrishnan (1988) argues that acquisition could sometimes be the culmination of a series of related strategic moves by the acquiring company to enter a new industry, and therefore, a significant fraction of the gains from synergy could have been anticipated by the capital market well before the acquisition.

Bettis (1981) investigated the performance of related and unrelated diversified firms in term of ROA. The results show that research and development expenditures are an important determinant in the performance advantage enjoyed by related diversified firms. Furthermore, related diversified firms outperformed unrelated diversified firms by about one to three percentage points in terms of return on assets, supporting the findings of Rumelt: managers of related firms should look for diversification opportunities in closely related areas rather than straying too far from the base business.

2.2 Corporate performance

Seth (1990) examined why related acquisitions might not outperform unrelated acquisitions on average. While the author found that some value was created in both cases, the results show no indication that related acquisitions create more value than unrelated acquisitions on average. Seth has analyzed the acquiring and target frims as a single entity, rather than focussing on either the bidder or the target separately.

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[11] Technologically related firm diversification strategies in manufacturing firms were broadly defined to include technologically and exploration spillover, vertical integration, product complementary and

Again, this study found that firm size had a significant effect on the results regarding differences in the extent of value creation. Acquisitions which are characterized by a significant size of the target relative to the bidder have greater potential for creating synergy via increased market power, economies of scale or of scope. Furthermore, his findings indicates that the expectations of the ability of firms to achieve synergy by vertical integration are low, which is in agreement with Rumelt's (1982) findings that firms following a dominant-vertical strategy performed poorly in comparison with single-business, related and conglomerate firms.

De (1992) examined the relationship between diversification patterns of corporations and their long-term performance. It appears that the standard performance measures suggested in corporate finance literature " rate all corporations equally in the long-run regardless of their diversification strategies ". Performance measures that involve both finance and accounting variables may offer an improvement.

Healy (1992) studied the fifty largest U.S. mergers between 1979 and mid-1984. He found that performance improvement was particularly strong for firms with highly overlapping businesses. According to a study of Agrawal et al. (1992), stockholders of acquiring firms suffer a statistically significant loss of about 10% over the 5-year post-merger period.

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conglomerate diversification.

By studying corporate focus, Comment & Jarrell (1995) found that consistent with shareholder wealth maximization, 55.7% of the exchange-listed firms had a single business segment in 1988, compared to 38.1% in 1979. Diversified firms were distinguished in the 1980s mostly by being relatively active participants, as both buyers and sellers, in the market for corporate control.

2.3 Acquisition as a response to competitive position and market structure

One theory of acquisition motivation holds that some acquisition activity is a defensive reaction to weak or deteriorating industry conditions and competitive position. Hopkins (1991) has tested the defensive response explanation by examining the link between acquisition-divestiture activity and two factors: the competitive position of acquiring firms in their home markets, and the market structure of these markets. The results indicate that a firm's prior circumstances are related to the intensity of both its acquisitions and divestitures, as well as the type of firms acquired.

More precisely, Hopkins found that the less attractive a firm's competitive position the more acquisitive it will be, which supports the "defensive diversification hypothesis". However, he could not conclude that the less attractive a firm's home industries the more acquisitive it will be. Moreover, he found that firms with a weak market share position might be trying to reinforce their weaknesses through related acquisitions.

In another paper, Hopkins (1987) examines three acquisition strategies which are used in his sample in order to analyse differences in the market position[12] of acquisitive firms. The strategies are: conglomerate (acquisition of companies in areas unrelated to the acquiring firm's main business), technology-related (acquisition of firms with the same or similar production techniques or product technology), and marketing-related (acquisition of firms with markets homogeneous to those of the acquiring firm). Hopkins (1987) measured market share, market concentration, market growth, and market profitability.

While acquisitive growth is generally associated with a decline in market position, the marketing-related strategy is associated with a distinctly superior position. Firms using this strategy are found in more profitable industries and to have higher market shares in these industries.

Hopkins (1987) concludes that if managers are committed to a long-term acquisition strategy, they may want to select their strategies based on considerations other than that of improvement in industry attractiveness or market share. Furthermore, it appears that the conglomerate strategy performs no worse than other acquisition strategies over time in regard to market position.

However, Wernerfelt and Montgomery (1986) propose that industry profitability is not a universal indicator of industry attractiveness – its meaning varies with the

[12] The phrase " market position " was used in this research to refer to : the attractiveness of the industries in which a firm produces output (measure by market structure variables), and the competitive position a

specific firms in question. Moreover, for " efficient firms " the industry is more attractive if industry profitability is high.

2.4 Vertical integration

For Galbraith and Stiles (1984), merger strategies can be a response to " bilateral market power " between buyer and seller. Thus, vertical integration can be viewed as a major way of expanding organizational domains in order to reduce or simply eliminate significant contingencies.

It appears, that the more an industry relies on another industry, in terms of selling outputs or purchasing inputs, the more likely an acquisition will occur in that industry. Similarly backward integration is the process where a firm can internalize the input market, mostly when it is confronted with a lack of buying power when purchasing inputs from its suppliers. Therefore, his conclusion remains that :

> "strategists need to consider not only the growth and profitability of markets when making diversification decisions, but also the degree to which extension into these markets will alleviate problems associated with relative power and resource dependency."

Boeker and Huo (1998) identified a core set of organizational characteristics influencing innovation adoption : forward and backward integration, size, and product diversity. They found that backward, forward integration and product diversity speed innovation while organizational size had no discernible effect.

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firm holds in its industries (measure by market share).

For example, internalizing the channels of technological input and product distribution can simplify coordination across " sequential stages of organizational activities, in turn permitting adoption to take place more quickly ". Thus, by backward and forward integrating, personal computer firms are better able to coordinate operations between internal divisions than between separate organizations.

In sum, backward integration provides a better understanding of the technology as it is being developed and an opportunity for organizations to quickly capitalize on new technologies in their own operations. Forward integration makes the functions of sales and distribution part of the organization, creating internal pressure on the organization to "adopt the new technology in hopes of being able to offer leading-edge products".

MacMillan et al. (1986) examine the decision to vertically integrate backwards from two perspectives : the extent to which vertical integration relieves the uncertainty of supply for a firm facing a variable demand function, and the threat that existing suppliers will retaliate if such vertical integration is attempted. The results show that buyers will be discouraged from backward vertical integration if both the likelihood and the severity of retaliation are high.

Martin (1986) found that integration is encouraged where there are relatively few firms in an industry and if sales are increasing. Backward integration often acts to increase industry concentration.

2.5 Others factors

In a study on the form of payment of mergers, Raghavendra and Vermaelen, (1998) found that bidders in mergers underperform while bidders in tender offers overperform in the three years after the acquisition. However, the long-term underperformance of acquiring firms in mergers was predominantly caused by the poor post-acquisition performance of low book-to-market "glamour" firms. Several authors have found that cash as the method of payment was positively correlated to acquirer's returns while stock was negatively correlated (Travlos, 1987; Loughran & Vijh, 1997).

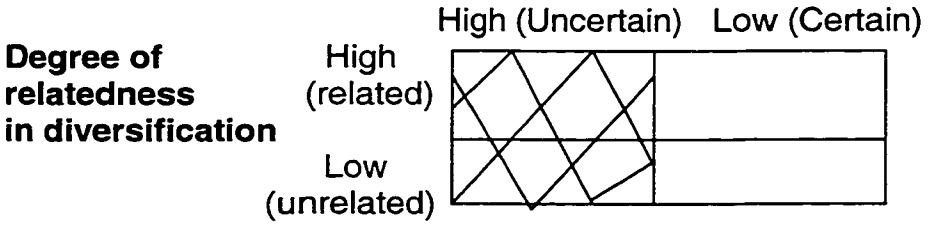
Markides & Oyon (1991) found that value creation was enhanced when the target's market is not perfectly competitive. Finally, in a rare study which implies technological convergence, Colombo et al. (1998) report widespread use of inter-industry (both equity and non-equity) joint collaborations from telecommunications firms into multimedia firms.

III- Hypotheses and predictions

This study primarily focuses on mergers, whether related or not, in uncertain environments. There is a strong debate about diversification. Several studies have found mixed results: sometimes supporting the benefits of related diversification, sometimes against it. This study is one of the first to focus on evolving industries with converging technological paths: the "information industries". These industries face significant uncertainty, principally due to technological change.

Exhibit 1 Scope of analysis of the study

Degree of uncertainty in the environment ("Information industries")



As has been mentioned earlier, "content" is playing a critical role in the fast moving technological environment. New technological devices and new processes are accentuating the demand for "content" in digitized forms. The media has already declared content owners the "new kings" in the multimedia landscape. It would be particularly interesting to analyze the performance of the players mostly involved at the beginning of the content value chain, which can be categorized into three sectors: content providers, information appliances and information highways.

It appears that old information industries defined by technology: Publishing, Photography, Broadcasting, Communications, Leisure, Entertainment, Computer, could be categorized into three new sectors: Information content (create & collect), Information appliances (display devices & store) and Information highways (process, applications & distribution). In term of M&A, the Information content sector (content creators and collectors) should create more shareholder value than others in the information industries environment (see Table 4 for the different categories). Since we do not have sufficient information on the targets[13], we will concentrate our analysis on the performance of the bidders. The first hypothesis examined is thus stated as follows:

H1: Mergers within the information content sector are expected to generate more shareholder value than mergers across sectors.

Furthermore, the computer hardware industry now has a more restricted role and this should be reflected in its valuations. This sector, and others facing below normal profitability should be more interested in backward integration. However, Seth (1990) finds that the ability of firms to achieve synergy by vertical integration are low, which is in agreement with Rumelt's (1982) findings that firms following a dominant-vertical strategy performed poorly in comparison with single-business, related and conglomerate firms. Furthermore, Seth documents that firm size has a significant effect on the results regarding differences in the extent of value creation.

[13] Most of the targets in our sample are private small firms that do not trade on public exchanges.

According to Christensen and Montgomery (1981) firms located in markets which constrain their growth or profitability are the most likely candidates for diversification. Firms or businesses in low opportunity markets are likely to find a similar lack of opportunity in new markets through constrained (strongly related) diversification. Therefore, they are more likely to pursue unrelated diversification. Hopkins (1991) found that the less attractive a firm's competitive position the more acquisitive it will be, which supports the "defensive diversification hypothesis".

According to the scope of the business segment served, firms have 4 broad types of organizations: single, dominant, related, unrelated (Rumelt, 1982). Appendix V gives more details on these types of organizations. For the purpose of this study, we define the sectors in the following manner. When a M&A is composed of two companies with the same two digit SIC code and within the same information sector (such as information highways) it is labeled " highly related", while when it is within the same information sector but not the same 2 digit SIC code, it is labeled "related". When the M&A is composed of two companies with the same two digit SIC code and not within the same sector it is labeled "unrelated", while when it is not in the same sector and two firms do not have the same 2 digit SIC code it is labeled "highly unrelated". Thus, M&As within the same information sector (highly related and related) are classified as "within sectors" while M&As not in the same information sector are classified as "across sectors". Exhibit 2 provides a summary of these definitions.

Exhibit 2 Scope of analysis of the sample

Highly related	M&A **with** same 2 first digit SIC code and **within** the same information sector (i.e. 7371 & 7372: Computer programming services & Prepackaged software; Microsoft & Hotmail)
Related	M&A **without** same 2 first digit SIC code and **within** the same information sector (i.e. 7375 & 2721: Information retrieval services & Periodicals; AOL & Time Warner)
Within sectors	Highly related + related
Unrelated	M&A **with** same 2 first digit SIC code and **not** in the same information sector (i.e. 7373 & 7375: Computer integrated systems design & Information retrieval services; Yahoo & Four11)
Highly unrelated	M&A **without** same 2 first digit SIC code and **not** in the same information sector (i.e. 4813 & 3574: Telephone communications & Computer Terminals; AT&T & NCR)
Across sectors	Unrelated + highly unrelated

It seems that exclusive reliance on a single mode of diversification (internal development or acquisition) restricts performance of organizations (Busija et al.,1997). Nguyen & Devinney (1990) document that technology-related diversification creates more shareholder value because of the economies of scope they generate. On the other hand, Gailbraith et al. (1986) find that unrelated diversifications create more value in uncertain settings. They present empirical evidence that unrelated diversification can represent a hedging strategy against the technological surprises that occur in industries with intensive research and development effort.

Firms pursuing synergy, with related diversification, can create common points of vulnerability to technological threat. In the same spirit, Michel and Shaked (1984), defenders of conglomerate M&A, state that under uncertainty, unrelated

activities tend to outperform related activities due to the hedging of "technological mugging".

Even though common technological factors affect the three sectors composing the content environment, some sectors face a higher level of technological uncertainty compared to others. We use research and development expenditures as a proxy for the level of uncertainty facing the three different sectors composing the content environment. Furthermore, we also control for firm size since it is a major factor influencing value creation in M&A. The next set of hypotheses examined are thus, as follows:

H2: For unrelated mergers across sectors, as uncertainty (as measured by R&D) rises, the expected shareholder gain increase

In the next step, we study mergers within the same sector instead of across the sectors, like in the last hypothesis. For the third hypothesis we refer to the sector in which firms spend the most in research and development as the most technologically uncertain sector[14]. The third hypothesis tested is thus:

H3: For highly related mergers within that sector, as uncertainty (as measured by R&D) rises, the expected shareholder gain decrease

Healy (1992) mentions that highly overlapping activities could be an explanation for the success of related M&A. Therefore we also analyze if the economies of scope (Devinney and Nguyen, 1990) arising from technologically related

[14] Using research and development expenditures as a proxy of technological uncertainty has some drawbacks. Potentially, we may encounter problems of misclassification.

activities with M&A materialize in the long-run even in uncertain environments like in information industries.

The popularity of related diversification strategies versus unrelated diversification strategies in some sectors of the "content environment" could be explained by the necessity to anticipate, or cope, with rapid technological changes and uncertainty with a minimal level of relatedness in firm's activities.

IV- Data and methodology

Our initial sample consisted of all the completed mergers and acquisitions in the American market (bidder or target on Amex, Nasdaq or NYSE) from 1993 to 1997 inclusively. From an initial sample size of 2,340 bidders form the Securities Data Corp Worldwide Mergers and Acquisitions database, we retained 344 completed mergers with available data on the CRSP database. As noted previously, most targets are private firms. Hence the analysis of targets is not undertaken in this study. In our initial sample of 2,340 M&A, 60 firms were engaged in direct acquisitions with the bidder being the "shareholders" (not a public firm). We deleted these observations except two acquisitions, where the bidder was not the "shareholders" but a public firm. The corresponding data on CRSP was not available so we finally kept only the completed mergers with no acquisitions. It appears from the data that mergers are definitely more popular than acquisitions in information industries.

Sample sizes vary for different event windows due to missing data on the CRSP database. We obtained information from the Compustat database on business segments for the mergers based on the level of research and development expenditures (used as a proxy for uncertainty). The segmentation of the bidders in our final sample is enumerated in Exhibit 3.

Exhibit 3 Segmentation of the bidders in our final sample

Information sector	Industry	SIC Codes
Information Content (Create & Collect)	▪ Publishing ▪ Entertainment ▪ Software	271 7371 272 7372 273 7375 274 781 792
Sub-total		**123**
Information Appliances (Display & store)	▪ Publishing ▪ Computer ▪ Electronics	275 5045 276 5046 277 5063 278 5064 279 5065 357 7377 365 7378 366 7379 367 369
Sub-total		**121**
Information Highways (Transport)	▪ Telecommunications ▪ Cable TV ▪ Broadcasting	481 7373 482 7374 483 782 484 783 489 784 573
Sub-total		**100**
Total		**344**

For an enumeration of the industries in the sample see Appendix IV.

4.1 Event study methodology

Using financial market data, an event study measures the impact of a specific event on the value of a firm. The usefulness of such a study comes from the fact that, given rationality in the marketplace, the effects of an event will be reflected immediately in security prices. In the U.S. there now exists, and will probably continue to exist for the foreseeable future, an active and liquid market for

companies and corporate assets. It is a market in which foreigners can and do compete on equal terms, depending on the industry. It is a market where the quality and availability of information is more highly developed than is the case anywhere else in the world and where regulatory and legal considerations combine to produce a favorable environment for corporate bid activity. Thus, a measure of the event's economic impact can be constructed using security prices observed over a relatively short time period. In contrast, direct productivity related measures may require many months or even years of observation.

The event study has many applications. In accountancy and finance research, event studies have been applied to a variety of firm specific and economy wide events. Some examples include mergers and acquisitions, earnings announcements, issues of new debt or equity, and announcements of macro-economic variables such as the trade deficit. In the majority of applications, the focus is the effect of an event on the price of a particular class of securities of the firm, most often common equity.

A mathematical explanation follows in order to illustrate the methodology of event studies. We assume that security returns follow a single factor model,

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

where R_{jt} is the rate of return on the common stock of the j^{th} firm on day *t*; R_{mt} is the rate of return of a market index on day t; ε_{jt} is a random variable that, by

construction, must have an expected value of zero, and is assumed to be uncorrelated with R_{mt}, uncorrelated with $R_{kt,k\neq j}$, not autocorrelated, and homoscedastic. β_j is a parameter that measures the sensitivity of R_{jt} to the market index. We define the *abnormal return* (or prediction error) for the common stock of the j^{th} firm on day *t* as:

$$A_{jt} = R_{jt} - (a_j + b_j R_{mt}),$$

where the coefficient a_j and b_j are ordinary least squares estimates of α_j and β_j. The *average abnormal return* (or average prediction error) AAR_t is the sample mean:

$$AAR_t = (\Sigma A_{jt})/ N ,$$

where *t* is defined in trading days relative to the event date (e.g. *t* = -60 means 60 trading days before the event and N is the number of firms in the sample). Over an interval of two or more trading days beginning with day T_1, and ending with T_2, *the cumulative average abnormal return* is

$$CAAR_{T1,T2} = \frac{1}{N} \sum_{j=1}^{N} \sum_{t=T1}^{T2} A_{jt}$$

In our study we use an estimation period of one year, 252 days in length which ends 40 days before the event date. Our test period begins 20 days before the event date and finishes 252 days after the announcement dates of the mergers.

4.2 Univariate and cross-sectional analysis

We used Minitab for testing for the equality of means and for testing for the equality of medians. For the tests of equality of medians, we performed a two sample rank test called the Mann-Whitney test which tests the equality of two population medians (we use a confidence interval of 95%). For the tests of equality of means, we used a two sample *t* test (test of 2 independent samples).

In order to determine the factors that affect the size of the abnormal returns for the bidding firms following the announcement of a merger within the information industries we perform cross-sectional analysis. Cross-sectional regressions were undertaken using SPSS. The estimated cumulative returns over five event windows: [-1,1], [-1,0], [0,1], [2,125] and [2,252] were use as dependent variables in separate regressions. The independent variables included the following:

1. INFORMATION SECTOR We controlled for the information industry effect by matching target and bidding firms according to their four-digits SIC codes. Furthermore, we classify these mergers inside one of the three sectors composing the information industries: content, appliances and highways Thus, three dummy variables, with each taking a value of one if the bidder is inside that sector and 0 if not are used in the regression.
2. METHOD OF PAYMENT Based on previous studies on M&A, this variable should hold significant explanatory power with cash having a positive

relationship with the abnormal returns, while stock having a negative relationship with abnormal returns (Travlos, 1987). We set CASH as a dummy variable that takes a value of 1 if the transaction is 100% cash, and is 0 otherwise, while a second dummy variable called STOCK that takes a value of 1 if the transaction is 100% stock, and 0 otherwise, and finally MIX that takes a value of 1 if the transaction is composed of both cash and stock, and 0 otherwise.

3. SIZE We calculate the size of the mergers by taking the VALUE OF TRANSACTION as a proxy for the target firm's size. We also determine the size of the bidder by taking as a proxy the amount of TOTAL ASSETS.

4. TECHNOLOGICAL UNCERTAINTY We finally estimate the corporate technological uncertainty by taking the proportion of research and development expenditures on the total assets of the bidder (RD/TA).

The cross-sectional regressions are based on the following general model:

$$CAR_{jt} = \alpha_j + \beta_1 \text{CONTENT}_j + \beta_2 \text{APPLIANCES}_j + \beta_3 \text{HIGHWAYS}_j +$$

$$\beta_4 \text{CASH}_j + \beta_5 \text{STOCK}_j + \beta_6 \text{MIX}_j + \beta_7 \text{VALUE OF TRANSACTION}_j +$$

$$\beta_8 \text{TOTAL ASSETS}_j + \beta_9 \text{RD/TA}_j + \varepsilon_j$$

We use both the univariate and multivariate regressions of all the above variables to determine their effects on the abnormal returns earned by bidders at the time of the merger announcement.

4.3 Possible biases

A number of possible biases can arise in the context of conducting an event study. Nonsynchronous trading can introduce a bias. The nontrading or nonsynchronous trading effect arises when prices are taken to be recorded at time intervals of one length when in fact they are recorded at time intervals of other possibly irregular lengths. For example, the daily prices of securities usually employed in event studies are generally "closing" prices, prices at which the last transaction in each of those securities occurred during the trading day. These closing prices generally do not occur at the same time each day. By calling them "daily" prices, one is implicitly and incorrectly assuming that they are equally spaced at 24-hour intervals. This nontrading effect induces biases in the moments and co-moments of returns. However, since we are dealing with public bidders trading in major stock exchanges we will still use the closing prices, the same methodology used by the event study software Eventus.

We are going to test the abnormal returns in the short term (few days) and long-term (one year). It is well known that event studies are more accurate when one studies the days close to the event. We obtain the results over one year as an indication of the performance of the events. However, we must be careful with such results because it can be biased by several other important events occurring in the year of analysis, which influenced the stock price.

V- Empirical results

A short-run and a long-run event study (few days to one year) is performed in order to test each hypothesis. As noted earlier, our study primarily focuses on diversification, whether related or not, in different degrees of uncertain environments. As discussed previously, there is a strong debate about diversification with several studies having found mixed results: sometimes supporting the benefits of related diversification, sometimes against it.

5.1 Analysis of traditional information industries

We begin first by examining the abnormal returns to bidders in the traditional industries: publishing, entertainment, electronics, computing and communications. The results are shown in table 1. For the shorter intervals around the announcement dates [-1,1] [-1,0] [0,1], we find statistically significant positive abnormal returns for electronics (within), computing (within and across) and communications (within). The results are very significant in the case of electronics (within) for the following windows [-1,1] [-1,0] [0,1] as it can be observed in table 1-B with the tests of equality of means (p-values: 0.11, 0.08, 0.06 respectively) and table 1-C with the tests of equality of medians (p-values: 0.05, 0.01, 0.10 respectively).

We find statistically significant negative abnormal returns in the short term for computing (within) right after the announcement date [2,5] and again negative returns in the long-term for computing (within) for the event windows [2,125]

[2,252] and across [2,252]). These results are striking given the evidence documented in the merger and acquisition literature where bidders, on average, tend to earn zero, or slightly negative abnormal returns around the announcement date. No significant abnormal returns are obtained in the shorter and longer event windows for entertainment[15]. We find a reversal in the abnormal returns in the short and long-term for computing (within). Right after the announcement [2,5] until one year [2,252], the results turned from positive to negative. The results are very significant for the following windows [2,10] [-10,10] [2,20] as it can be observed in table 1-B with the tests of equality of means and in table 1-C with the tests of equality of medians.

The market responded most favorably in the case of mergers within the communications sector: an abnormal return of 5.19% for the event window [-5,5], significant at 0.01. It is followed by the interval [-1,0] for mergers within the electronics sector with an abnormal return of 3.33%, significant at 0.01. Finally, the third most favorable reaction of the market was mergers within the computing sector for the interval [-1,0] with an abnormal return of 2.69% significant at 0.01 (all results are detailed in table 1-A).

The two worst reactions of the market were for mergers in the long-term [2,252], within the communications sector (AR: -20.07% significant at 0.01) and across

[15] Few observations are obtained.

the communications sector (AR: -19.94% significant at 0.05). Both results can be seen in table 1-A.

5.2 Analysis of the degree of technological uncertainty

In absolute values the content sector has the lowest level of research and development expenditures (table 2). However, in proportion to total assets {R&D/total assets (%)}, the appliances sector has the lowest level of R&D expenditures, followed by the highways and the content sector.

Based on research and development expenditures in proportion to total assets, it is reasonable to assume that the content sector is the most technologically uncertain sector while the appliances is the least technologically uncertain sector. Even though the difference between the highways and the appliances sectors in terms of research and development expenditures is not significant (p-value of 0.87 in table 3), we still evaluate the performance of the highways sector (with the appliances sector) when dealing with the least technologically uncertain sector. Research and development expenditures are expensed when incurred in the U.S., and they could be capitalized if various conditions are met outside the U.S.. Since we have American bidders, this accounting measure does not help to explain why the differences between the highways or the appliances sector are not striking.

5.3 Discussion of the hypotheses

Table 4 provides the results for bidders classified by new information industries. It is segmented into three sectors by which the industries are realigning: information content, information appliances and information highways (see Appendix II for an illustration). We do not have enough observations for related mergers in the content sector (2), unrelated mergers in the appliances sector (3) and related mergers in the highways sector (4) for any meaningful analysis of these subgroups.

H1: Mergers within the information content sector are expected to generate more shareholder value than across the sectors.

Table 5-A shows that the first hypothesis is partially false. It is not true according to the event window [-1,0]. Mergers across the content sector outperformed mergers within the sector (2.56% versus 1.86% significant at 0.05 and 0.01 respectively). Furthermore, for event windows [2,5] [-5,5] [2,10] [-10,10] [2,20], mergers within (related + highly related) the sector were outperformed by mergers across (unrelated + highly unrelated) the content sector. Finally, in the long-term [2,252], the market reacted negatively for mergers within the content sector (AR: -16.80%, significant at 0.05) while the results were not statistically different from zero for the same event window in the case of mergers across the sector. We must keep in mind that the differences are small principally around the announcement date.

In the short-term around the announcement date (AR: 0.93% for the event window [0,1], for mergers within the content sector versus AR: –0.26% for

mergers across the content sector), the test of equality of medians (p-value: 0.10 as reported in table 5-C) shows that the abnormal returns between mergers within and across the content sector were statistically different for this event window. An observation supporting the first hypothesis is the event window [2,60] where the performance of mergers across the sector was more negative compared to mergers within the sector (AR: -12.17%, significant at 0.05 versus –4.79%, not significant). The tests of equality of means and medians (as shown in table 5-B and 5-C), report statistical differences between the mergers within and across the content sector for this event window (p-values of 0.04 for the test of equality of means and 0.09 for the test of equality of medians).

The mixed results for the first hypothesis can be explained by the insufficient number of observations for related mergers (2) within the content sector. The results for related mergers in the content sector are not meaningful. A surprising result is the market's positive reaction for the event window [-1,0] for highly unrelated mergers, which is contrary to the predictions of the first hypothesis. Thus, mergers outside the content sector are more rewarded by the financial market. However, we have to be cautious in interpreting this result since it is the case for only one event window [-1,0] and we have only 20 observations for highly unrelated mergers in the content sector. We have to keep in mind that these mergers are unrelated to the content sector but it is still in the information industries like we defined it. So, one may argue that there may still be a certain level of relatedness in these transactions (i.e. technological risk). The least

favorable reaction of the stock market in the content sector was for highly related mergers in the long-term [2,252] (AR: -17.62%, significant at 0.01, table 5-A).

H2: For unrelated mergers across sectors, as uncertainty (measured by R&D) rises, the expected shareholder gain increase

The most technologically uncertain sector is the information content sector. This result can be explained by the importance of software players in the sample, which rely heavily on research and development investments. The results do not support the second hypothesis. Unrelated mergers across the content sector are not associated with the highest shareholder gain. Thus, no event window has an abnormal return statistically different from zero. Unrelated mergers for the highways sector, one of the least technologically uncertain sector, received a more positive reaction around the announcement date (table 7-A) compared to unrelated mergers of the content sector, the most technologically uncertain sector. We cannot do the comparison with the appliances sector since there is not enough observations (3, table 6-A). However, it is the event window [-1,0] for highly unrelated mergers that represent the highest shareholder gain in the content sector (AR: 2.83%, significant at 0.05, table 5-A). So, the hypothesis could be supported if we had picked highly unrelated mergers instead of unrelated. One could argue that since highly unrelated mergers represent the highest level of diversification possible inside the information industries, it should be used instead of unrelated mergers for the second hypothesis. In this sense, there is partial support for the second hypothesis.

H3: For highly related mergers within that sector, as uncertainty (measured by R&D) rises, the expected shareholder gain decrease

We could not differentiate between the appliances sector and the highways sector for the least technologically uncertain sector, so we will analyze both. In the appliances sector, the market reacted most positively for highly related mergers around the announcement date [-1,1] [-1,0] [0,1] (AR: 3.02%, significant at 0.01; 4.05%, significant at 0.001; 2.15%, significant at 0.01, table 6-A). These results are very significant according to the tests of equality of means (p-values: 0.01, 0.10, 0.02) and medians (p-values: 0.03, 0.03, 0.03) of table 6-B and 6-C. Surprisingly, we find very significant positive abnormal returns for an event window before the announcement date in related mergers [-10,-2] (AR: 7.46%, significant at 0.05, table 6-A). The test of equality of means indicates a p-value of 0.10 and the test of equality of medians shows a p-value of 0.04 (tables 6-B and 6-C). This is the only time that the abnormal returns is significantly positive before the announcement date in any one of the three information industry sectors. It could be explained by the possibility of information leakage about the mergers prior to the actual announcement. However, we must be cautious since we have only 14 observations for related mergers within the appliances sector. The least favorable types of mergers in the long term in this information sector were mergers across the appliances sector: the mean abnormal return for the window [2,252] is -20.74%, and is significant at 0.05 (table 6-A). Overall, our results in the appliances sector appear to support the third hypothesis.

Next, we look at the highways sector to test again the third hypothesis. We find the same pattern in the abnormal returns. The short-term results of highly related mergers within the sector and unrelated mergers across the sector are statistically significantly positive. These results support the third hypothesis. We report a significant difference between the short-term results of mergers within the sector versus across the highways sector. In this sector, there is no reversal in the short-term results of the mergers within the sector as was observed in the case of the content or appliances sector. Thus, while the abnormal returns are positive for the event windows [-1,1] [-1,0] [0,1], we find that the abnormal returns are positive after the announcement date also: [2,5] [-5,5] [-10,10] (refer to table 7-A). These results are very significant if we look at the tests of equality of means for two of the event window [2,5] and [2,20] (p-values: 0.08, 0.05, table 7-B) and the tests of equality of medians (p-values: 0.06, 0.04, table 7-C). Thus, we can affirm that the third hypothesis is supported by our results since it is consistent with both the appliances and highways sector, the two least technologically uncertain sectors.

Overall, for the three information sectors, the three most positive response of the market were; related mergers in the appliances sector, event window [-10,-2] (AR: 7.46%, significant at 0.05, table 6-A), mergers within the highways sector, event window [-5,5] (AR: 5.62%, significant at 0.05, table 7-A) and finally the highly related mergers within the highways sector for the event window [-10,10] (AR: 4.98%, significant at 0.05, table 7-A).

The three most negative response of the market were all in the long-term [2,252] in the three information sectors. The least favorable was unrelated mergers in the highways sector (AR: -26.55%, significant at 0.01, table 7-A). The next least favorable was mergers across the appliances sector (AR: -20.74%, significant at 0.05, table 6-A). Finally the least favorable response of the market was documented in highly related mergers in the content sector (AR: -17.62%, significant at 0.01, table 5-A)

5.4 Cross-sectional analysis

Tables 8-A to 13-C show the results of the cross-sectional univariate and multivariate regressions that were performed for five different event windows. We ran regressions of estimated cumulative abnormal returns for the following five event windows: [-1,1], [-1,0], [0,1], [2,125] and [2,252] days. The first regression consisted of all the information sectors combined, while the second regression consisted of the content sector only. The highways and the appliances sectors were also regressed separately. The independent variables for the information sector and the method of payment (cash, stock or mix) were coded as dummy variables (i.e 0 or 1) while the rest of the variables: the size of the target (value of transaction), size of the bidder (total assets) and the proportion of research and development expenditures on total assets were coded in the usual manner.

5.4.1 Univariate regression results

We ran univariate regressions on the CARs for all of the independent variables. We found that the variable METHOD OF PAYMENT was significant at either the 1% or 5% level for each event window in all the information sectors combined. Also, we found that the CARs had a positive relationship with the variable CASH, notably for longer windows [2,125] and [2,252] days. The beta coefficients for CASH were 0.174 for the event window [2,125], 0.317 for the event window [2,252] and they were both significant at the 1% level (see table 8-A). A positive relationship for longer event windows was observed when examining the results of the content sector (table 8-B). We also found a positive relationship between the CARs of the highways sector and the independent variable MIX (table 8-C). We also document a positive relationship for the [2,252] days event window in the appliances sector (table 8-B). These combined results suggest that CASH is a significant predictor of longer period CARs of different sectors (i.e. 6 to 12 months). This is particularly true for the content sector.

When examining the global picture of the combined information sectors, and the regression results of each information sector, we find that the variable VALUE OF TRANSACTION was surprisingly not significant. It fared poorly in determining future CARs. The variable TOTAL ASSETS was significant for the [2,252] event window in the appliances sector only. We found that the variable RD/TA (R&D expenditures to total assets) was significant for several event windows. These were: [-1,0] (significant at the 10% level with an R^2 of 11%) for

the highways sector, and the following windows for the information sectors: [-1,1], [-1,0] and [2,252]. All were significant at the 5% level (see table 10-A). For short-term windows: [-1,1] & [-1,0] days, the relationship between CARs and RD/TA is weakly negative for all the information sectors combined (table 10-A). In the content sector, the same relationship is positive for the [2,252] days event window (table 10-B). Interestingly enough, the variable RD/TA seems to affect the CARs of the content sector for the longer-term, which is also the most technologically uncertain sector.

5.4.2 Multivariate regression results

To further investigate our data, we analyzed combinations of independent variables separately. We found that the combination METHOD OF PAYMENT and VALUE OF TRANSACTION was significant for three different event windows (table 11-A). The event window [-1,1] was significant at the 10% level while the [-1,0] event window was significant at the 5% level. There was a slightly positive relationship with the variable MIX and the CARs of the information sector (significant at 5%) for these two event windows.

The third significant event window was [2,252] days (significant at the 10% level). In this case, there was a positive relationship with the CARs for this sector and the variable CASH (coefficient: 0.277, significant at 5%). The variable CASH was not significant in the short-term.

When examining the content sector, we find similar results (table 11-B). However, the variable CASH had a slightly negative relationship in the short-term [-1,0] and a positive relationship in the medium-term (6 months). The variable CASH is not significant for the longer-term, i.e. [2,252] days.

The combination of RD/TA & TA regressed on the CARs for all the information sectors was significant for three event windows (see table 12). The [-1,1] event window was significant at the 10% level, and the relationship between the RD/TA variable and the CARs was negative for the information sector (coefficient: -0.155, significant at the 5% level). The second event window [0,1] yielded similar results at the 10% level of significance. Lastly, the [2,252] event window produced surprising result, the coefficient of the variable RD/TA shifted from negative to largely positive. This might be indicating that the market believes (in the short-term) that a company cannot increase shareholder value by relying heavily on R&D expenditures in proportion to total assets. However, when examining longer periods [2,252], a reversal in the reaction of the market is observed.

It seems that after one year has elapsed, the perception of the market regarding value-creation through R&D expenditures changes completely. In the longer-term, a high RD/TA ratio is considered as a very beneficial factor contributing to added shareholder value for bidders involved in a merger transaction in the information industry. These results support the hypothesis of technological

hedging. It suggests that a firm which relies heavily on R&D in proportion to its total assets could merge with another firm in the information industry to reduce technological uncertainty and increase shareholder value.

When analysing all the independent variables for all information sectors we find one significant result at the 10% level: event window [2,252] (table 13-A). In this case, the variable APPLIANCES is significant at the 10% level, and the variable HIGHWAYS is significant at the 5% level for the [2,252] window.

When examining the highways sector only, we find three significant event windows (table 13-C). However, we must be cautious with our results since we have only 16 observations for this group. The first window of [–1,1] days is significant at the 5% level. Also, the variable CASH has a positive relationship in the highways sector, which is significant at the 5% level. The variable RD/TA has a negative significant relationship with the CARs of the highways sector in the short-term. Furthermore, the variable MIX has a very significant negative relationship with the CARs of the highways sector. The same negative relationship is consistent with other longer term event windows such as [2,252] days. The variable MIX is also related in negative manner with the CARs of the highways sector.

5.5 Explanations in the choice of a mergers and acquisitions policy

The actual transformation of the information industries will result according to the International Engineering Consortium (1999) into three (instead of 5) main industries: digitized content, multimedia devices, and convergent networks. We are just seeing the beginning, in the 1990's, of the adaptation movement via M&A in the information industries, in order to cope with this transformation:

> "Each form of information has been dominated in the past by an industry that focused on one or two functional core competencies (entertainment and publishing on content, consumer electronics and personal computing on devices, telephone companies on transportation). However, each form-based industry had to perform all five basic functions. This kind of vertical integration is not sustainable, as each "form" industry was highly inefficient in some areas and efficient in others areas."

Thus, some companies from each form-based industry[16] are becoming the new incumbents in the functionally defined industries[17] of the future. It seems that they will best be positioned to extend their functional core competence and broaden their base across all the different media (as shown in Appendix VII).

Core competencies could explain the choice of particular M&A strategies with the popular business belief "improve and stay to your knitting" (corporate focusing). It could help explain at the same time the difficulty of corporate managers involved in highly unrelated strategies (conglomerates) to obtain positive returns. It may simply represent over stretching the organizational competencies.

[16] Appendix II, first figure.
[17] Appendix II, second figure.

Busija et al. (1997) found that exclusive reliance on a single mode (internal development or acquisition) can restrict performance. Thus, it has been found that internal development as a mode of entry should complement the use of related strategies (i.e. Microsoft strategy[18]), while acquisition as a mode of entry should complement the use of unrelated strategies (CMGI strategy, for instance). Microsoft tend to acquire minority interests in many firms operating in different industries close to software while CMGI is more a technology holding company, investing in business-to-business e-commerce firms.

According to Christensen and Montgomery (1981), Rumelt's category scheme can perhaps best be viewed as a means for distinguishing a few distinct groups from other firms in general. They argue that:

> "firms located in markets which constrain their growth or profitability are the most likely candidates for diversification. Firms or businesses in – low opportunity - markets are likely to find a similar lack of opportunity in markets which they could enter through constrained diversification. Therefore, they are more likely to pursue unrelated diversification."

It may explain the success of unrelated mergers in the highways sector. While Rumelt (1982) found that diversifying firms perform better than others, he can not explain why so many related constrained[19] firms have changed their strategies and moved into unrelated business postures. An explanation of this strategic shift could be a form of technological uncertainty hedging[20].

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[18] See Appendix IV for a list of the M&A of Microsoft in the last 5 years.
[19] Similar to the concept of " highly related " M&A.
[20] However, it appears that high performing related-constrained firms were operating in high-growth concentrated industries.

According to Michel and Shaked (1984) the earnings streams resulting from related diversification are subtantially correlated (e.g. earlier than expected technological obsolescence of a similar production technology), it is unlikely that total risk will be significantly reduced. Thus, related diversification is likely to yield potential synergy, but has little total risk reduction and has an uncertain impact on the level of systematic risk.

If we look at our results, in the case of the highways sector, the statement concerning the positive impact of technological unrelated diversification is supported. Thus, four event windows in the short-term show significant positive abnormal returns with unrelated mergers (table 7-A): [-1,1], [-1,0], [0,1] [-5,5]. We may consider that in this information sector, a risk reduction may be linked to unrelated mergers in the short-term since the CARs have the highest value, but not necessary in two other information sectors (appliances and content). However, it may exists a small risk reduction for highly unrelated mergers in the content sector for the event window [-1,0] where the abnormal returns has the highest value (AR: 2.83%, significant at 0.05, table 5-A). These results occur even though the information highways sector represents the sector with the least level of technological uncertainty, calculated by the research and development expenditures. However, in the mid and long-term [2,125] [2,252] the opposite occurs: unrelated mergers in the information highways sector do not show a risk reduction with an abnormal return of -12.08%, significant at 0.05 and –26.55%, significant at 0.01 (table 7-A).

We now have to analyze the dilemma between the findings of Gailbraith et al. (1986) who found that unrelated diversification seems valuable in uncertain settings and Nguyen & Devinney (1990) who argue that technology-related diversification is valuable because of the economies of scope that are generated, which result in greater firm performance. Our results can't support or deny Nguyen & Devinney (1990) because in two of the three sectors (content and highways), we have less than 10 observations for related mergers. However, the short-term results [-1,1] to [-5,5] in the highways sector support Gailbraith et al. (1986).

Unrelated diversification could represents a hedging strategy against the technological surprises occuring with research and development investments. It seems that the technological base of any firm's product in the highways sector, along with its production and marketing capacity, have a greater chance to be rendered obsolete by a competitor's discovery, a " form of technological mugging " . Thus, diversification away from this source of potential technological mugging provides an obvious and reasonable hedge against such threat.

On the other hand we have reported the work of Lubatkin & O'Neill (1987) who found that related mergers are connected with a significant decline in systematic and total risk. They argue that observers should make a clear distinction between corporate strategy and portfolio strategy and suggests that corporate managers should focus their attention on building competitive advantages in

each participating market rather than pursue new markets for the sole purpose of hedging corporate bets. It may be a more appropriate analysis for managers in the appliances sector where highly overlapping activities could be an explanation of the success of the highly related mergers in the short-term (Healy,1992). Therefore the economies of scope coming from technologically related M&A (Devinney and Nguyen, 1990) are not materializing in the long-run [2,252] in the case of the three information sectors.

Concerning vertical integration, Galbraith and Stiles (1984) found that the more an industry relies on another industry, in terms of selling outputs or purchasing inputs, the more likely an acquisition will occur in that industry. For them, strategists need to consider not only the growth and profitability of markets when making diversification decisions, but also the degree to which extension into these markets will alleviate problems associated with relative power and resource dependency.

Furthermore, backward integration provides a better understanding of the technology as it is being developed and an opportunity for organizations to quickly capitalize on new technologies in their own operations. Forward integration makes the functions of sales and distribution part of the organization, creating internal pressure on the organization to adopt the new technology in hopes of being able to offer leading-edge products.

We have already discussed the high demand of content in digitized forms due to rapid technological change and availability of bandwidth. Content providers have a market power not necessarily available to appliances or highways providers. We see a higher number of mergers across sectors for appliances and highways compared to content providers (table 4).

Seth (1990) suggests acquisitions which are characterized by a significant size of the target to the bidder have greater potential for creating synergy via increased market power, economies of scale or of scope. On average the market value of the bidders in our sample were different ($2,145 M for highways, $660 M for content and $927 M for appliances). The differences in size may explain the variations in the abnormal returns between the three information sectors. Mergers of large capitalization may have maybe greatly influenced the results.

5.6 Limitations of the study

Among the limits of this study is the use of SIC code to categorize the sample into three sectors. The classification made by the database Securities Data is of course imperfect. Furthermore, companies may have major businesses in different industries with different SIC code, like in the case of conglomerates. However, we retained only the one selected by the database. An example of this problem can be illustrated with the firm Yahoo. It is classified as computer integrated systems (highways provider) in 1997, even though it is now a major

content provider: the nature of its business changed quickly from a simple search engine in less than two years.

Balakrishnan (1988) argues that the acquisition could be sometimes the culmination of a series of related strategic moves by the acquiring company to enter a new industry, and therefore, a significant fraction of the gains from synergy could have been anticipated by the capital market well ahead of the acquisition. It is a similar concept to the anticipated effect of acquisition programs made public by firms. The anticipation of the market may have affected partially our results. A final limit is the use of research and development expenditures as a proxy of technological uncertainty, which is only an approximation of the reality.

VI- Conclusion

We addressed two main issues in this study: (1) to what extent the level of relatedness among targets and bidders in the information industries affect the shareholder value of the bidders, and (2) what is the performance of related versus unrelated mergers in the information industries compared to what has been documented in the broad literature.

We examined the differences between the traditional organization of the information industries with the new one proposed by the International Engineering Consortium (1999). We analyzed the performance of content providers involved in mergers within the information sector compared to the content providers doing mergers across the sector. We did the same with the appliances and highways sectors. We found that on average and in the short-term, the market reacted the most positively for mergers within an information sector than across, around the announcement date of the transaction.

Particularly, we wanted to know if the content owners were really the "kings" as called by the business press and are earning above-normal profits in mergers. Our results could not support this statement. On average bidders within the information content sector have not outperformed bidders in the appliances or the highways sector. The statement may still be true in the case of the performance of the targets in the information content sector.

The three most positive reactions of the market were for mergers in short-term periods. They are all significant at the 5% level. The first one is related mergers in the appliances sector [-10,-2], CAR of 7.46%, the second are mergers within the highways sector [-5,5], CAR of 5.62% and the third one are highly related mergers again in the highways sector [-10,10], CAR of 4.98%. We could conclude that, on average, mergers within the information content sector have created more shareholder value than across the sectors, but only around the announcement date, in the short-term. In the information industries, backward integration toward content creators and packagers ("information content providers") is more popular than forward integration, which is explained by the higher number of mergers across the highways and content sectors.

The literature reports mixed results concerning the effect of diversification with mergers and acquisitions. Our findings are consistent with this literature but we found interesting patterns by focussing on technologically converging industries. Thus, we report a difference between the success of mergers in the information highways sector, the information content and appliances sectors.

The popularity of highly related mergers versus unrelated mergers in the information appliances sector could be explained by the necessity to anticipate or cope with rapid technological changes and great uncertainty with a certain level of relatedness in firm's activities while doing diversification strategies in this sector. However, in the information highways sector unrelated mergers

performed as well as highly related mergers in the short-term. In the highways sector, unrelated diversification could represents a hedging strategy against the technological surprises occuring with research and development investments. Nevertheless, the economies of scope (Devinney and Nguyen, 1990) coming from technologically related mergers do not seem to materialize in the long-run.

The cross-sectional analysis seems to reveal that for the market, research and development expenditures on total assets is an important factor which help to explain the cumulative abnormal returns of the bidders involved in mergers, in all the information industries. This variable was significanty negative in the short-term while it was significantly and largely positive in the long-term.

The main limitation of the study was the use of SIC codes in order to create information sectors. The presence of few majors business sectors in a firm and the rapid change of the nature of several businesses represent the shortcomings of this methodology.

6.1 Further research

Another interesting way to analyze the information industries could be to include Canadian data and see if the same conclusions hold in the Canadian market like in the American market. Including the targets when the information is available could be very interesting on a portfolio approach.

Furthermore, it would be interesting to analyze in an integrated way, the modes of diversification like in the model of Datta et al. (1991)[21]. One could differentiate between the performance of the different players: single business (businesses with more than 95% of their activities involved in one segment) versus the dominant business (between 70 and 95% of their activities come from one business segment), the related business (less than 70% come from one segment, but the major related segments represent more than 70% of the activities[22]) against the unrelated (less than 70% of their activities come from one business segment and the major segments are not linked), for those involved in M&A activities.

However, an interesting analysis could be to see whether single business players or related-constrained diversified firms tend to continue their strategy, or are presently modifying it in order to anticipate or cope with technological change via M&A activities. It has been previously mentioned that firms which rely on one source of diversification only, whether it is via internal development or M&A tend to be outperformed by firms which use a mix of activities.

Another tangent of this study could be to explore and find explanations on the performance of "kereitsus" with unrelated and highly unrelated M&A.

[21] See Appendix VI.
[22] If the major business segments share common core skill, strength or resource it is called " related constrainsts ", otherwise it is called " related linked ".

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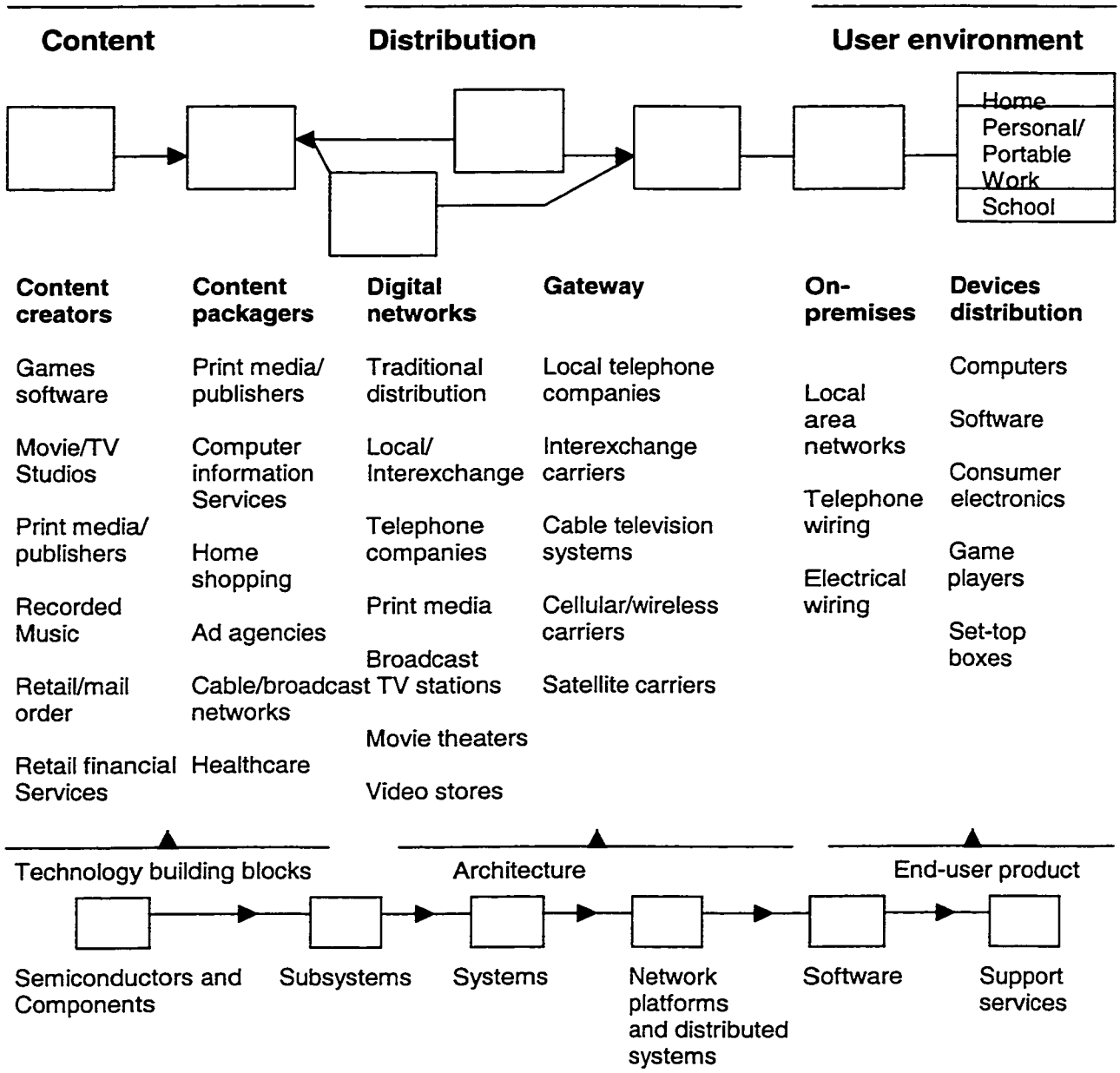
Appendix I

The multimedia value chain
McKinsey Quarterly, 1994



Appendix II

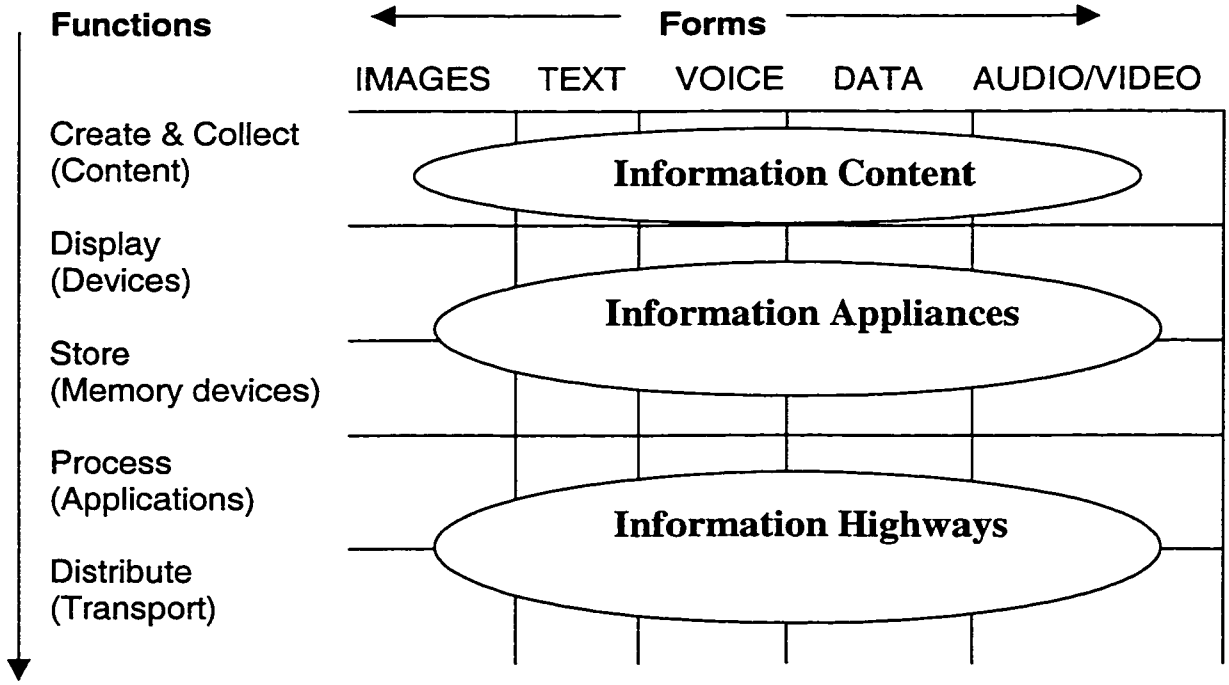
The actual information Mega-Industry

International Engineering Consortium, May 1999

Functions	Forms: IMAGES	TEXT	VOICE	DATA	AUDIO/VIDEO
Create & Collect (Content)	PHOTO	PUB	TELE-COMMUNICATIONS	COMPUTING	ENTERTAINMENT
Display (Devices)	TOGRAPHY	LISHING	MMU	PUT	ERT
Store (Memory devices)	RAP	HIN	NIC	IN	AIN
Process (Applications)	H Y	G	ATI		MENT
Distribute (Transport)			ONS		

How the Information industry is realigning

International Engineering Consortium, May 1999



Appendix III

Microsoft's mergers and acquisitions in the last 5 years

http://www.microsoft.com/msft/invest.htm, February 12, 2000

Date	Company	Status
2000		
January 12, 2000	Yam Digital Technology	Investment
January 12, 2000	Digex	Investment
January 11, 2000	Keen.com	Investment
January 11, 2000	Corio	Investment
1999		
December 29, 1999	Commtouch	Investment
December 21, 1999	DiscoverMusic.com	Investment
December 21, 1999	Encoding.com	Investment
December 20, 1999	INTERVU	Investment
December 16, 1999	Best Buy	Investment
December 15, 1999	Winstar Communications	Investment
November 12, 1999	GigaMedia Ltd.	Investment
November 11, 1999	RadioShack	Investment
October 29, 1999	Entropic	Acquisition
September 27, 1999	Akamai	Investment
September 17, 1999	Softway Systems	Acquisition
September 15, 1999	Visio	Acquisition
September 8, 1999	Asia Global Crossing	Investment
September 7, 1999	United Global Communications	Investment
August 17, 1999	Globo Cabo S.A.	Investment
August 10, 1999	DSL.net	Investment
July 21, 1999	STNC	Acquisition
July 12, 1999	Rogers Communications	Investment
July 7, 1999	Zoomit	Acquisition
July 1, 1999	Sendit	Acquisition
June 22, 1999	Concentric Network	Investment
June 14, 1999	Omnibrowse	Acquisition
June 8, 1999	Inprise	Investment
June 7, 1999	ShadowFactor	Acquisition
June 3, 1999	Wink Communications	Investment
June 1, 1999	D.E.N.	Investment
May 24, 1999	CareerBuilder	Investment
May 20, 1999	WebMD	Investment
May 10, 1999	Nextel Communications	Investment
May 6, 1999	Telewest Communications	Investment
May 6, 1999	AT&T	Investment
April 26, 1999	Jump Networks	Acquisition
April 19, 1999	Access Software	Acquisition
April 19, 1999	NorthPoint Communications	Investment
March 31, 1999	Portugal Telecom	Investment
March 17, 1999	Rhythms	Investment
March 11, 1999	ThingWorld.com	Investment
March 11, 1999	Audible.com	Investment
March 8, 1999	Reciprocal	Investment
March 4, 1999	CompareNet	Acquisition
March 2, 1999	Dialogic	Investment
Jan.25, 1999	United Pan-Europe Communications N.V.	Investment
Jan. 25, 1999	NTL Inc.	Investment

Jan. 11, 1999	Banyan Systems	Investment
Jan. 7, 1999	FASA Interactive	Acquisition

1998

Dec. 17, 1998	CMGI	Investment
Dec. 14, 1998	Qwest Communications	Investment
Nov. 10, 1998	*Wireless*Knowledge	Investment
Nov. 5, 1998	LinkExchange	Acquisition
August 25, 1998	Valence Research	Acquisition
June 29, 1998	OpenPort	Investment
June 18, 1998	Pluto Technologies	Investment
June 15, 1998	RoadRunner	Investment
June 15, 1998	Avid Technology Acquires Softimage	Investment
June 4, 1998	Tut Systems	Investment
May 27, 1998	VenturCom, Inc.	Investment
April 28, 1998	The MESA Group	Acquisition
April 27, 1998	Reservation Works LLC	Investment
April 9, 1998	Firefly Network	Acquisition
April 4, 1998	Accel Partners	Investment
March 3, 1998	General Magic	Investment
Feb. 23, 1998	Flash Communications	Acquisition
Feb. 17, 1998	SaveSmart	Investment
Jan. 12, 1998	ShareWave	Investment

1997

Dec. 31, 1997	Hotmail	Acquisition
Dec. 9, 1997	Elemental Software Inc.	Investment
Dec. 9, 1997	Digital Sound Corporation	Investment
Oct. 20, 1997	Wildfire Communications	Investment
Sept. 22, 1997	E-Stamp Corporation	Investment
Sept. 11, 1997	Lernout & Hauspie	Investment
Sept. 9, 1997	TRADOS	Investment
Aug. 25, 1997	Efusion	Investment
Aug. 6, 1997	Apple Computer	Investment
Aug. 5, 1997	Vxtreme	Acquisition
July 29, 1997	Navitel	Investment
July 21, 1997	RealNetworks	Investment
June 30, 1997	LinkAge Software	Acquisition
June 26, 1997	First Data	Investment
June 13, 1997	Cooper & Peters	Acquisition
June 9, 1997	Comcast	Investment
May 7, 1997	Dimension X	Acquisition
April 6, 1997	WebTV Networks	Acquisition
March 3, 1997	Intersé	Acquisition
Feb. 19, 1997	Digital Anvil	Investment

1996

Dec. 17, 1996	Proginet	Investment
Dec. 10, 1996	NetCarta	Acquisition
Dec. 10, 1996	CMGI	Investment
Dec. 6, 1996	Verisign	Investment
Nov. 20, 1996	ResNova Software	Acquisition
Oct. 29, 1996	OLAP technology from Panorama Software	Acquisition
Oct. 28, 1996	VDOnet	Investment
Sept. 30, 1996	WebTV	Investment
Sept. 9, 1996	SingleTrac Entertainment Technologies	Investment
June 24, 1996	Entex	Investment

June 17, 1996	Electric Gravity Inc.	Acquisition
June 11, 1996	eShop Inc.	Acquisition
May 7, 1996	Tandem	Investment
April 15, 1996	EXOS Inc.	Acquisition
April 9, 1996	Helicon Publishing Limited	Investment
April 8, 1996	aha! Software	Acquisition
April 1,1996	MTel (SkyTel)	Investment
March 12, 1996	Colusa and Aspect	Acquisition
Feb. 1, 1996	Black Entertainment Television	Investment
Jan. 16, 1996	Vermeer Technologies Inc.	Acquisition

1995

Dec. 14, 1995	NBC	Investment
Dec. 12, 1995	Bruce Artwick Organization Ltd.	Acquisition
Nov. 6, 1995	Interoperability Technology, Expertise from Netwise Inc.	Acquisition
Oct. 16, 1995	The Blue Ribbon SoundWorks, Ltd.	Acquisition
Oct. 11, 1995	Individual Inc.	Investment
Aug. 2, 1995	Digital	Investment
July 31, 1995	Dare to Dream Intertainment	Acquisition
July 10, 1995	SNMP Technology From Network Managers	Acquisition
April 12, 1995	Wang	Investment
March 22, 1995	DreamWorks SKG	Investment
March 20, 1995	Vanstar	Investment
Feb. 23, 1995	RenderMorphics, Ltd.	Acquisition
Jan. 13, 1995	UUNET	Investment

1994

Dec. 21, 1994	TCI Technology Ventures	Investment
Nov. 15, 1994	One Tree Software	Acquisition
Nov. 1, 1994	NextBase	Acquisition
Sept. 27, 1994	Altamira	Acquisition
June 28, 1994	SOFTIMAGE	Acquisition

Appendix IV

Legend of SIC codes: major traditional information industries in the sample

Communicati.	Publishing	Computing	Entertainment	Electronics
481 Telephone communica-tions	271 Newspaper publishing or printing	357 Computer and office equipment	781 Motion pictures production and allied	365 Household audio and video equipment
482 Telegraph and others	272 Periodicals	5045 Computer peripheral equip. And software	782 Motion pictures distribution and allied	366 Communicat. Equipment
483 Radio and television broadcasting	273 Books	5046 Commercial equipment	783 Theaters	367 Electronic component and accessories
484 Cable, pay services	274 Miscellaneous publishing	7371 Computer programming services	784 Video tape rentals	369 Miscellan. Electronics
489 Other Commun. Services	275 Commercial printing	7372 Prepackaged software	792 Theatrical producers, bands Orchestras	5063 Electrical apparatus, etc
	276 Manifold business forms	7373 Comp. Integrated systems design		5064 Electrical appliances, etc
	277 Greeting cards	7374 Comp. Proc. And data preparation and proc. Services		5065 Electronic parts, etc
	278 Blankbooks, etc	7375 Information retrieval services		573 Radio, TV, consumer electronics, music stores
	279 Service industries for the printing trade	7377 Comp. Rental and leasing		
		7378 Comp. Maintenance and repair		
		7379 Comp. Related services		

Appendix V

Definition of Rumelt's categories

(Christensen and Montgomery; 1981)

-***Single** business*: Any firm which derives 95% or more of its revenues from one business

-***Dominant** business*: Any firm which derives 70-94% of its revenues from its largest single business.

Dominant firms were divided in 4 sub-classifications:

-*Dominant vertical*: Any dominant firm with a high vertical ratio.

-*Dominant constrained*: Any dominant firm which diversified by building on a single strength or resource associated with the original business

-*Dominant linked*: Any dominant firm which diversified on the basis of one of several strengths or resources. The particular strength or resource varied across the different businesses in the firm.

-*Dominant unrelated*: Any dominant firm whose diversification activities are not related to the dominant business.

-***Related** business:* Any firm deriving less than 70% of its sales from a single business and possessing a high relatedness ratio.

Related firms were divided into two sub-classifications:

-*Related constrained*: Any related firm which diversified by building on a single strength or resource associated with the original business.

-*Related linked*: Any related firm which diversified on the basis of one of several strengths or resources. The particular strength or resource varied across the different businesses in the firm.

-***Unrelated** business*: Any firm deriving less than 70% of its sales from a single business and possessing lower relatedness ratios.

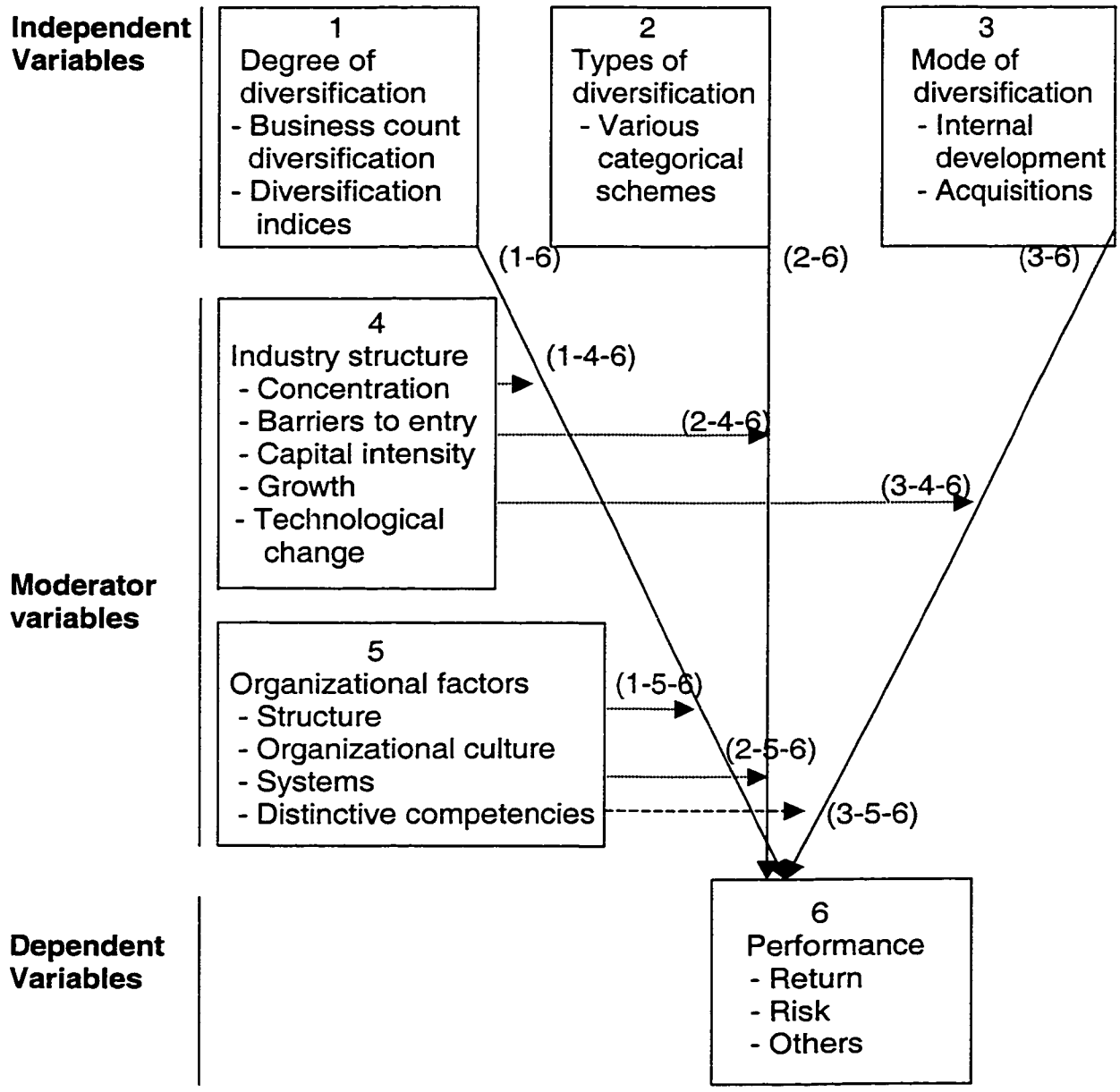
Unrelated firms were divided into two sub-classifications:

-*Multi-business*: Any unrelated firm containing a few large unrelated businesses.

-*Unrelated-portfolio*: Any unrelated firm containing many unrelated businesses.

Appendix VI

Datta et al.'s framework on the relationship of diversification and performance



Appendix VII

Core competencies in the new information industry (International Engineering Consortium, 1999)

Types of information business	Examples of needed core competencies	Current industries mapping to it
Information Content	▪ Fostering and managing creativity ▪ Information gathering ▪ Programming skills	▪ Publishing ▪ Entertainment ▪ Software
Information Appliances	▪ Global presence (for volume sales) ▪ Strategic outsourcing ▪ Design and manufacturing expertise ▪ Concurrent engineering and marketing ▪ Portability ▪ High storage capacity battery power	▪ Consumer electronics ▪ PC manufacturers
Information Highways (transport)	▪ Network management ▪ Interactive communications ▪ Billing systems ▪ IT platforms	▪ Public telephone networks ▪ Cable TV ▪ Broadcast media ▪ Private networks

Table 1-A Cumulative daily abnormal returns for the bidders in the traditional information industries: publishing, entertainment, electronics, computing and communications sectors, (1993-1997)

	Publishing		Entertainment		Electronics		Computing		Communications	
Event window	Within (highly r. + related)	Across (unrel. + highly u.)	Within (highly r. + related)	Across (unrel. + highly u.)	Within (highly r. + related)	Across (unrel. + highly u.)	Within (highly r. + related)	Across (unrel. + highly u.)	Within (highly r. + related)	Across (unrel. + highly u.)
(-20,-2)	-0.29	1.69	10.67	4.29	2.58	4.17	-2.05	0.74	-0.01	2.75
(-10,-2)	0.21	-0.57	5.28	5.56	1.91	2.01	-1.22	0.95	0.45	5.03
(-5,-2)	-1.27	1.91	7.34$	4.33	0.53	0.52	-0.44	0.26	1.14	2.25
(-1,1)	0.40	-2.31*	-1.18	12.30***	2.87*	-0.01	2.32***	1.39	2.25**	3.19$
(-1,0)	0.64	-0.95	-5.50$	10.40***	3.33***	0.88	2.69***	1.94*	1.49*	2.83$
(0,1)	0.40	-1.85*	2.02	9.47***	2.38*	-0.69	1.40**	0.95	1.92**	1.81
(2,5)	0.68	-0.83	-6.40	-2.16	-0.76	0.03	-1.67*	-1.27	1.79$	-0.36
(-5,5)	-0.18	-1.23	-0.23	14.46**	2.64	0.54	0.19	0.38	5.19**	5.09
(2,10)	2.59	-0.33	-3.93	-6.11	-2.30	0.51	-2.70*	-0.05	2.04	-4.43
(-10,10)	3.21	-3.23	0.17	11.75	2.49	2.51	-1.60	2.29	4.75*	3.79
(2,20)	3.43	1.80	-10.08	-9.54	-4.04	-0.50	-4.08**	0.97	-0.13	-4.91
(2,60)	1.03	-1.57	-43.49*	-13.09	-2.00	3.87	-6.84*	-6.12	-4.25	-1.95
(2,125)	0.52	-10.27	-63.07*	-9.01	-5.02	3.83	-11.49**	-7.12	-6.81	3.39
(2,252)	-12.94	-27.00**	-137.11***	-15.38	-10.07	-12.61	-20.07***	-19.94*	-10.41	19.29
N	17	4	2	5	36	38	148	58	41	10

$ significant at .10 * significant at .05 ** significant at .01 *** significant at .001

Table 1-B Tests of equality of means (p-values)

Event window →

Within Vs Across	(-1,1)	(-1,0)	(0,1)	(2,5)	(-5,5)	(2,10)	(-10,10)	(2,20)	(2,60)	(2,125)	(2,252)	N
Publi-shing	0.10	.33	0.13	0.58	0.93	0.49	0.09	0.98	0.99	0.58	0.36	17 Vs 4
Enter-tainment	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	2 Vs 5
Elec-tronics	0.11	.08	0.06	0.68	0.45	0.29	0.93	0.43	0.71	0.64	0.61	36 Vs 38
Com-Puting	0.50	.56	0.82	0.45	0.72	0.03	0.07	0.02	0.63	0.57	0.73	148 Vs 58
Commu-nications	0.59	.46	0.94	0.12	0.89	0.02	0.75	0.37	0.78	0.43	0.13	41 Vs 10

n.m.: not meaningful, not enough observations (<10 observations)

Table 1-C Tests of equality of medians (p-values)

Event window →

Within Vs Across	(-1,1)	(-1,0)	(0,1)	(2,5)	(-5,5)	(2,10)	(-10,10)	(2,20)	(2,60)	(2,125)	(2,252)	N
Publi-shing	0.14	0.56	0.17	0.62	0.82	0.75	0.23	0.89	0.82	0.62	0.30	17 Vs 4
Enter-tainment	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	2 Vs 5
Elec-tronics	0.05	0.01	0.10	0.49	0.62	0.28	0.94	0.69	0.59	0.60	0.67	36 Vs 38
Com-Puting	0.81	0.71	0.70	0.22	0.68	0.09	0.10	0.04	0.67	0.97	0.70	148 Vs 58
Commu-nications	0.43	0.43	0.63	0.15	0.80	0.03	0.95	0.19	0.93	0.54	0.18	41 Vs 10

n.m.: not meaningful, not enough observations (<10 observations)

Table 2 Levels of research & development expenditures and market values for the different information sectors (1993-1997)

Sector	Number of firms	Mean R&D ($M)	R&D/ Total assets (%)	R&D/MV (%)
Highways	52	133	9.53	6.2
Content	109	40	14.58	6.0
Appliances	180	51	8.91	5.5

R&D: Research & development expenditures (both from Compustat) MV: Market Value

Table 3 Test of equality of medians regarding research and development expenditures for different information sectors (p-values)

Highways vs Content	0.00
Highways vs Appliances	0.87
Content vs Appliances	0.00

Table 4 Segmentation of mergers in the new information industries (1993-1997)

Level of Relatedness	Information Content	Information Appliances	Information Highways	Total	Pro-portion of total
Highly related	90	57	52	199	58%
Related	2	14	4	20	6%
Sub-total (Within)	92	71	56	219	64%
Unrelated	11	3	30	44	13%
Highly unrelated	20	47	14	81	23%
Sub-total (Across)	31	50	44	125	36%
Total	123	121	100	344	100%

Table 5-A Cumulative daily abnormal returns for the bidders in the Information Content sector, for the period 1993-1997

Event Window	Highly Related	Related	Within (highly r. + related)	Unrelated	Highly Unrelated	Across (unrel. + highly u.)
(-20,-2)	-2.03	3.59	-1.91	1.97	0.43	0.97
(-10,-2)	-2.66*	13.90	-2.30$	4.20	-0.22	1.34
(-5,-2)	-2.24**	7.23	-2.03*	5.14	-0.82	1.29
(-1,1)	0.66	34.72***	1.40$	0.89	0.91	0.91
(-1,0)	1.27*	28.47***	1.86**	2.08	2.83*	2.56*
(0,1)	0.35	27.21***	0.93	0.50	-0.68	-0.26
(2,5)	-1.73*	-7.41	-1.86*	-2.38	-3.53*	-3.12$
(-5,5)	-3.31*	34.54**	-2.49$	3.65	-3.43	-0.92
(2,10)	-3.12*	-15.08	-3.38**	-4.68	-0.89	-2.23
(-10,10)	-5.12**	33.54$	-4.28*	0.41	-0.19	0.01
(2,20)	-3.00	-20.99	-3.39$	-1.78	-0.25	-0.80
(2,60)	-4.44	-20.40	-4.79	-11.33	-12.63$	-12.17*
(2,125)	-7.70	0.15	-7.48	-13.23	-6.45	-8.87
(2,252)	-17.62**	24.49	-16.80*	-7.03	-21.27	-16.47
N	90	2	92	11	20	31

$ significant at .10 * significant at .05 ** significant at .01 *** significant at .001

Table 5-B Tests of equality of means (p-values)

Event window →

Level	(-10,-2)	(-5,-2)	(-1,1)	(-1,0)	(0,1)	(2,5)	(-5,5)	(2,10)	(-10,10)	(2,20)	(2,60)	(2,252)	N
Within Vs Across	0.34	0.14	0.48	0.78	0.33	0.86	0.76	0.45	0.54	0.67	0.04	0.36	92 Vs 31
Highly Related Vs Related	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	90 Vs 2
Unrelated Vs highly unrelated	0.48	0.16	0.79	0.62	0.81	0.89	0.53	0.34	0.78	0.95	0.78	0.88	11 Vs 20

Table 5-C Tests of equality of medians (p-values)

Event window →

Level	(-10,-2)	(-5,-2)	(-1,1)	(-1,0)	(0,1)	(2,5)	(-5,5)	(2,10)	(-10,10)	(2,20)	(2,60)	(2,252)	N
Within Vs Across	0.17	0.09	0.61	0.89	0.10	0.57	0.40	0.57	0.24	0.50	0.09	0.13	92 Vs 31
Highly Related Vs Related	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	90 Vs 2
Unrelated Vs highly unrelated	0.45	0.27	0.64	0.52	0.92	0.66	0.70	0.47	0.50	0.95	0.55	0.85	11 Vs 20

Table 6-A Cumulative daily abnormal returns for the bidders in the Information Appliances sector, for the period 1993-1997

Event window	Highly Related	Related	Within (rel. + Highly)	Unrelated	Highly Unrelated	Across (unrel. + highly)
(-20,-2)	0.47	8.73$	2.10	-1.47	0.30	0.19
(-10,-2)	1.79	7.46*	2.91*	-2.35	-0.78	-0.87
(-5,-2)	0.50	2.06	0.81	-2.53	-0.18	-0.33
(-1,1)	3.02**	-1.66	2.10*	1.77	1.36	1.38
(-1,0)	4.05***	0.78	3.40***	0.66	1.65$	1.59$
(0,1)	2.15**	-2.55	1.22$	2.13	1.04	1.10
(2,5)	-0.31	-0.47	-0.34	-1.03	-0.74	-0.76
(-5,5)	3.22$	-0.08	2.57	-1.79	0.42	0.29
(2,10)	-0.86	0.51	-0.59	-2.37	-0.57	-0.67
(-10,10)	3.95	6.30	4.42*	-2.94	0.01	-0.16
(2,20)	-3.05	2.16	-2.01	-6.75	-1.46	-1.78
(2,60)	-4.23	0.47	-3.29	-13.92	-0.42	-1.22
(2,125)	-7.49	2.35	-5.40	-11.36	-4.27	-4.65
(2,252)	-13.38	-10.72	-12.92$	-46.36$	-19.15$	-20.74*
N	57	14	71	3	47	50

$ significant at .10 * significant at .05 ** significant at .01 *** significant at .001

Table 6-B Tests of equality of means (p-values)

Event window →

Level	(-20,-2)	(-10,-2)	(-1, 1)	(-1, 0)	(0,1)	(-5, 5)	(-10,10)	(2,252)	N
Within Vs Across	0.33	0.07	0.75	0.17	0.91	0.37	0.23	0.28	71 vs 50
Highly Related Vs Related	0.11	0.10	0.01	0.10	0.02	0.29	0.64	0.77	57 vs 14
Unrelated Vs Highly Unrelated	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	3 vs 47

n.m.: not meaningful, not enough observations (<10 observations)

Table 6-C Tests of equality of medians (p-values)

Event window →

Level	(-20,-2)	(-10,-2)	(-1, 1)	(-1, 0)	(0,1)	(-5, 5)	(-10,10)	(2,252)	N
Within Vs Across	0.61	0.15	0.77	0.29	0.91	0.41	0.29	0.44	71 vs 50
Highly Related Vs Related	0.19	0.04	0.03	0.03	0.03	0.49	0.90	0.98	57 vs 14
Unrelated Vs Highly Unrelated	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	3 vs 47

n.m.: not meaningful, not enough observations (<10 observations)

Table 7-A Cumulative daily abnormal returns for the bidders in the Information Highways sector, for the period 1993-1997

Event window	Highly Related	Related	Within (rel. + highly)	Unrelated	Highly Unrelated	Across (unrel. + highly)
(-20,-2)	0.24	6.33	0.68	-0.76	1.28	-0.25
(-10,-2)	0.65	5.38	0.99	0.41	4.30$	1.17
(-5,-2)	1.25	4.37	1.47	1.15	2.21	1.34
(-1,1)	2.24**	2.26	2.24*	2.07*	0.20	2.49**
(-1,0)	1.28$	6.37	1.66*	1.56*	-0.14	1.52*
(0,1)	2.02**	-0.06	1.87*	1.78*	-0.47	1.82*
(2,5)	1.31	9.38	1.89$	1.59	-0.61	-0.09
(-5,5)	4.81**	16.02	5.62**	4.82**	1.80	3.74*
(2,10)	2.08	5.05	2.29	1.51	-2.17	-0.79
(-10,10)	4.98*	12.71	5.53*	3.99	2.33	2.87
(2,20)	-0.23	16.94	0.98	0.11	-7.55*	-5.36*
(2,60)	-3.62	12.67	-2.46	-4.43	-8.95	-8.13$
(2,125)	-7.31	16.35	-5.63	-12.08*	-9.83	-10.78$
(2,252)	-14.25$	9.89	-12.24	-26.55**	-15.09	-17.23*
N	52	4	56	30	14	44

$ significant at .10 * significant at .05 ** significant at .01 *** significant at .001

Table 7-B Tests of equality of means (p-values)

Event window →

Level	(-10,-2)	(-1,1)	(-1,0)	(0,1)	(2,5)	(-5,5)	(-10,10)	(2,20)	(2,60)	(2,125)	(2,252)	N
Within vs Across	0.99	0.74	0.94	0.88	0.08	0.46	0.49	0.05	0.17	0.68	0.85	56 vs 44
Highly Related Vs Related	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	52 Vs 4
Unrelated Vs Highly Unrelated	0.17	0.10	0.17	0.03	0.78	0.64	0.81	0.73	0.21	0.19	0.22	30 Vs 14

n.m.: not meaningful, not enough observations (<10 observations)

Table 7-C Tests of equality of medians (p-values)

Event window →

Level	(-10,-2)	(-1,1)	(-1,0)	(0,1)	(2,5)	(-5,5)	(-10,10)	(2,20)	(2,60)	(2,125)	(2,252)	N
Within vs Across	0.85	0.95	0.57	0.82	0.06	0.47	0.62	0.04	0.23	0.89	0.88	56 vs 44
Highly Related Vs Related	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	52 Vs 4
Unrelated Vs Highly Unrelated	0.06	0.24	0.13	0.03	0.85	0.87	0.59	0.83	0.41	0.55	0.27	30 Vs 14

n.m.: not meaningful, not enough observations (<10 observations)

Table 8-A Cross-sectional univariate regression results (1993-1997), Dependent variable: cumulative abnormal returns for all information sectors, Independent variable: method of payment

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	3.685*	3.455*	3.707*	3.9060*	4.847**
R-Square	0.023	0.022	0.023	0.025	0.03
Intercept	0.012$	0.02**	0.007	-0.18**	-0.337**
CASH	-0.002	-0.009	-0.003	0.174**	0.317**
MIX	0.038**	0.025*	0.031*	0.041	0.009
DF	311	311	311	311	311

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 8-B Cross-sectional univariate regression results (1993-1997), Dependent variable: cumulative abnormal returns for the Content sector, for some event windows, Independent variable: method of payment

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	2.89$	4.076*	2.156	5.004**	4.402*
R-Square	0.05	0.069	0.038	0.083	0.074
Intercept	0.013	0.023*	0.009	-0.199**	-0.319**
CASH	-0.034	-0.035$	-0.03	0.294**	0.496**
MIX	0.064$	0.051$	0.035	0.22	0.322
DF	112	112	112	112	112

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 8-C Cross-sectional univariate regression results (1993-1997), Dependent variable: cumulative abnormal returns for the Highways sector, for some event windows, Independent variable: method of payment

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	2.68$	2.633$	1.955	1.031	0.6
R-Square	0.058	0.057	0.043	0.023	0.014
Intercept	0.006	0.003	0.0071	-0.136*	-0.29*
CASH	0.035	0.028$	0.015	0.081	0.128
MIX	0.043*	0.032*	0.037*	-0.107	-0.132
DF	89	89	89	89	89

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 8-D Cross-sectional univariate regression results (1993-1997), Dependent variable: cumulative abnormal returns for the Appliances sector, for some event windows, Independent variable: method of payment

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	0.558	0.837	0.789	0.814	1.996
R-Square	0.01	0.016	0.015	0.015	0.036
Intercept	0.015	0.029**	0.006	-0.191**	-0.398**
CASH	-0.003	-0.016	0.006	0.142	0.326$
MIX	0.021	0.011	0.023	0.077	-0.0075
DF	108	108	108	108	108

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 9 Cross-sectional univariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for all information sectors, for some event windows, Independent variable: value of transaction

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	0.328	0.447	0.163	2.776$	2.487
R-Square	0.001	0.002	0.001	0.012	0.011
Intercept	0.023**	0.025**	0.016**	-0.156**	-0.302
Value of transaction	-0.000	-0.000	-0.000	1.77E-04$	0.000
DF	229	229	229	229	229

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 10-A Cross-sectional univariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for all information sectors, for some event windows, Independent variable: research and development expenditures on total assets (RD/TA)

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	4.459*	0.58	4.736*	1.462	5.258*
R-Square	0.031	0.004	0.033	0.01	0.036
Intercept	0.03**	0.016$	0.026**	-0.189**	-0.418**
RD/TA	-0.149*	-0.041	-0.124*	0.478	1.494
DF	141	141	141	141	141

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 10-B Cross-sectional univariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for the Content sector, for some event windows, Independent variable: technological uncertainty, research and development expenditures on total assets (RD/TA)

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	2.341	0.163	3.594$	0.953	2.806$
R-Square	0.036	0.003	0.054	0.015	0.043
Intercept	0.038$	0.0016	0.035*	-0.164	-0.296$
RD/TA	-0.173	-0.033	-0.165$	0.49	1.377$
DF	64	64	64	64	64

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 11-A Cross-sectional multivariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for all information sectors, for some event windows, Independent variables: method of payment and value of transaction

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	2.375$	2.798*	1.948	2.005	2.494$
R-Square	0.031	0.036	0.025	0.026	0.032
Intercept	0.014	0.021**	0.011	-0.187**	-0.362**
CASH	0.002	-0.009	-0.005	0.131$	0.277*
MIX	0.045*	0.034*	0.031*	0.012	0.004
Value of transaction	-0.000	-0.000	-0.000	0.000	0.000
DF	229	229	229	229	229

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 11-B Cross-sectional multivariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for the Content sector, for some event windows, Independent variables: method of payment and value of transaction

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	2.306$	3.898*	1.594	2.879*	2.047
R-Square	0.077	0.123	0.054	0.094	0.069
Intercept	0.018	0.026*	0.013	-0.2**	-0.315**
CASH	-0.027	-0.041$	-0.027	0.302**	0.48*
MIX	0.096*	0.08*	0.053	0.235	0.378
Value of transaction	-0.000	-0.000	-0.000	-0.000	-0.000
DF	86	86	86	86	86

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 12 Cross-sectional multivariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for all information sectors, for some event windows, Independent variables: research and development expenditures on total assets (RD/TA), and total assets (TA)

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	2.427$	0.403	2.613$	0.956	3.278*
R-Square	0.034	0.006	0.036	0.014	0.045
Intercept	0.032**	0.017$	0.028**	-0.198**	-0.442**
TA	-0.000	-0.000	-0.000	0.000	0.000
RD/TA	-0.155*	-0.044	-0.129*	0.511	1.585*
DF	141	141	141	141	141

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 13-A Cross-sectional multivariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for all information sectors, for some event windows, Independent variables: all

$$CAR_{jt} = \alpha_j + \beta_1 \text{APPLIANCES}_j + \beta_2 \text{HIGHWAYS}_j + \beta_3 \text{CASH}_j + \beta_4 \text{STOCK}_j + \beta_5 \text{MIX}_j + \beta_6 \text{VALUE OF TRANSACTION}_j + \beta_7 \text{TOTAL ASSETS}_j + \beta_8 \text{RD/TA}_j + \varepsilon_j$$

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	1.174	0.713	0.748	0.845	2.805$
R-Square	0.088	0.055	0.058	0.065	0.147
Intercept	0.063*	0.024	0.039	0.028	0.048
APPLIANCES	-0.037$	-0.021	-0.017	-0.127	-0.349$
HIGHWAYS	-0.009	0.003	-0.002	-0.101	-0.507*
STOCK	-0.021	-0.001	-0.004	-0.229$	-0.387$
MIX	0.033	0.034	0.024	-0.083	-0.338
Value of transaction	0.000	-0.000	-0.000	0.000	0.000
TA	-0.000	-0.000	-0.000	0.000	0.000
RD/TA	-0.189$	-0.066	-0.148$	0.407	1.189
DF	92	92	92	92	92

Unstandardized coefficients
$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 13-B Cross-sectional multivariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for the Content sector, for some event windows, Independent variables: all

$$CAR_{jt} = \alpha_j + \beta_1 CASH_j + \beta_2 MIX_j + \beta_3 VALUE\ OF\ TRANSACTION_j + \beta_4 TOTAL\ ASSETS_j + \beta_5 RD/TA_j + \varepsilon_j$$

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	1.368	0.473	0.72	1.666	0.818
R-Square	0.146	0.056	0.083	0.172	0.093
Intercept	0.038	0.016	0.037	-0.113	-0.279
CASH	-0.023	-0.017	0.000	0.373*	0.387
MIX	0.041	0.037	0.011	0.261	0.456
Value of transaction	0.000	0.000	0.000	-0.000	-0.000
TA	-0.000*	-0.000	-0.000	-0.000	-0.000
RD/TA	-0.109	0.008	-0.101	0.135	0.92
DF	45	45	45	45	45

Unstandardized coefficients

$, *, ** shows significance at the 10%, 5% and 1% levels respectively

Table 13-C Cross-sectional multivariate regression results (1993-1997), Dependent variable: cumulative abnormal returns returns for the Highways sector, for some event windows, Independent variables: all

$$CAR_{jt} = \alpha_j + \beta_1 CASH_j + \beta_2 MIX_j + \beta_3 \text{VALUE OF TRANSACTION}_j + \beta_4 \text{TOTAL ASSETS}_j + \beta_5 RD/TA_j + \varepsilon_j$$

Variables	[-1,1]	[-1,0]	[0,1]	[2,125]	[2,252]
F-stat	3.341*	2.645	1.579	3.749*	3.466*
R-Square	0.626	0.569	0.441	0.652	0.634
Intercept	0.055	0.038	0.057	-0.162	-0.586
CASH	0.143*	0.111*	0.095	0.091	0.053
MIX	0.10	0.08	0.032	-1.598**	-2.687**
Value of transaction	0.000	0.000	0.000	0.000	0.000
TA	-0.000*	-0.000$	-0.000	-0.000	-0.000
RD/TA	-0.679*	-0.44$	-0.58$	0.142	0.58
DF	15	15	15	15	15

Unstandardized coefficients

$, *, ** shows significance at the 10%, 5% and 1% levels respectively