"Flexible Commitments: Coping with Chaos"

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Flexible Commitments: Coping with Chaos

Abstract

Technological change and deregulation have made possible the congruence of fifty erstwhile distinct industries to form one mega INFOCOM (information and communications) industry. This paper describes some of the major changes driving this congruence and examines their consequences for the competitive context of this emerging industry. The resulting complexity and dynamics will force parts of the industry to drift toward chaos from time to time. The paper examines critically the relevance of existing strategy concepts for coping with the near chaos conditions of the INFOCOM industry, and offers an alternative framework anchored around flexible commitments.

(Technological Change, Strategic Flexibility, Coping with Turbulence)

A Brave New World

> She picked up her virtual reality interface, "VR shades" most people called them. Gradually images began forming on the inside of the "lenses". Inclining her head slightly she had the sensation of floating towards them. Moving past the CNN rolling newscast that she subscribed to, she picked the entrance to the public library at Grandville. She noted from the panel which glowed in the middle distance up and to her left that the library environment resource utilization was 60%. It was quite busy today. She headed for the Master Catalog Manager, the MCM. "I'm looking for a paper on coping with chaos" she asked. "written around 1994 and pertaining to the INFOCOM industry". After only a fraction of a second's hesitation the MCM smiled; it had obviously found the paper she wanted. Glancing up toward the status display she saw she had now spent 97 seconds 'in' the library. The current connect charge, $0.50, wasn't too much but she decided to read the paper at home. "Could you mail it please?" she asked. "Certainly" said the MCM, and with a polite "Have a nice day" faded away leaving in its place a portal labelled "fast-path home".

Although seemingly in the realms of science fiction, the virtual trip to the library described above is within reach of technology today. Soon a single portable product will allow the user to make voice or video-phone calls, pick up voice, video or data mail messages, access and run remote computer application programs, browse through libraries or public databases, watch news broadcasts and films and even perhaps play the odd computer video game. Customized information will be provided via a communications utility in much the same way that electricity is today and just as widely available. The information and communications industries (INFOCOM) are becoming one integrated entity.

This paper discusses the limitations of existing strategic concepts for competing in this mega-industry, and offers an alternative approach that shows promise. The paper first presents some of the major changes affecting the INFOCOM industry. The next section conceptualizes the competitive challenge posed to firms in the industry by these changes. The third section discusses the limited applicability of existing strategic management concepts for meeting this challenge. The paper concludes with an alternative framework for competing in industries near chaos, like INFOCOM.

The Changing INFOCOM Industry Context

The brave new world sketched above brings together a variety of industries This convergence may be conceptualized as in Figure 1, first as a consolidation within the four major segments: the information content providers, the infrastructure industries that help add value to this content, the communications conduit providers, and the infrastructure industries that help provide the equipment and devices that are needed to enhance the value of these conduits. The INFOCOM industry space thus covers numerous SIC codes as illustrated in Figure 2. Technological advances and the world-wide trend towards deregulation and privitization have been two major external factors that have driven the further convergence of the four segments towards a common mega-industry, referred to here as the INFOCOM industry. .

Technology as a Change Force

Technological advances have blurred the distinctions between various forms of information, i.e. voice, data/image and video, and made their processing and transport common. The old distinctions between the consumer electronics, computers, office products and telecommunications industries are disappearing. As information gets digitized, its processing, in whatever form, will belong to a single industry.

Semiconductor devices are now capable of processing high-speed images and managing data communications interfaces at the rate of hundreds and thousands of megabits per second. Even as the price of semiconductor devices continues to drop, technological performance keeps rising. Integration density and performance per chip has doubled every 1.5 years while prices have remained virtually the same.[1] Trends show that every 7 years the cost of processing, measured by the cost per logic gate, has fallen by a factor of 10.[2] Tasks that twenty years ago were performed only by large mainframes costing millions of dollars can today be done on machines costing a few

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1 "Clearing the Hurdles - the Race for Europe," Dr Hans Bauer, Executive Vice President, Siemens AG, Dataquest Europe Ltd, p10.

2 The Economist, A Survey of Telecommunication, October 5 1991.

thousand dollars and perhaps in another twenty years time the same power will cost only a few hundred dollars.

The falling of barriers between information forms will increasingly lead to firms moving into niches in which they could not participate previously. But this can bring surprising retaliation from the incumbent firms as well. Witness, for example, Eastman Kodak whose main markets - photographic films - is under attack from computer and office products firms. In response Kodak has produced a complete system for storing photographs on compact disks (CDs) which can then be played back on home television sets. The system includes the hardware and software needed by film processing laboratories for transferring the images from conventional film onto a CD, and a CD player for the consumer to replay the pictures at home. Moreover, in conjunction with Adobe Systems, Kodak is also marketing the software component as a PC based image processing and enhancement system in direct competition with firms from the computer and office products industry that make image processing equipment. Kodak's deep understanding of the image enhancement techniques (which had hitherto been achieved with conventional photographic processes) is enabling it to leap ahead of its competitors, and to set the standards for image processing software.

The technology led convergence of information forms also has implications for the consumer electronics industry. Today, with an appropriate add-on tuner card, television broadcasts can be watched on the screen of a home computer. Televisions, on the other hand, have been for some time part of many home computer set-ups and integral to computer games configurations. One can visualize in the not too distant future a single telecomputer that is a fax-phone, radio, a high definition TV, an audio and video recorder / player, an image copier and a computer. The television and home computer will increasingly resemble each other, with large data storage, processing and interactive capabilities. Computer firms will enter the market that was once the domain of the consumer electronics giants, such as Sony, Matsushita, and Philips. Though the consumer electronics firms may have an edge in marketing and distribution, computer manufacturers have a slight lead technologically, but both are strong contenders to offer the next generation of home entertainment products. The one area in which there seem to be relatively

few contenders is in software. The new 'telecomputers' will require robust operating software. Microsoft has already identified this as a major opportunity, and is well on its way towards development of software for the set top box which will provide a "Windows" like interface for program selection and video on demand.

In the information transport sector, there have been similar impressive advances that make it possible to integrate voice, data and video transmission. Frame relay and cell transfer technologies provide the ability to transmit a mixture of image, data, and voice through self-healing, highly reliable networks. They provide the capability needed to provide a band width-on-demand service, which will be enhanced when B-ISDN (broad band ISDN) or a network based on ATM (Asynchronous Transfer Mode) switch technology becomes available world-wide. Voice compression algorithms, one of the benefits of digital encoding, enables transmission, storage and processing of voice in narrow bandwidth and without excessive storage requirements. The pervasive use of fibre optics in communication networks also provides the broad band capability that is required for full voice/data/video information integration. The cost of installing a meter of fibre has dropped dramatically from $11.00 in 1978, and estimates suggest it could fall to as little as 0.50c by 1998.[3] Latest advances in security technologies will facilitate the conduct of commercial transactions electronically over a public switched telephone network. Finally, advances in spread spectrum transmission technology and radio micro cells will allow wireless networks to emerge faster and offer the same capacity that wireline services offer today.

Advances in communications capabilities and falling costs are already leading to huge growth in information exchange on computer networks such as Compuserv and Internet. This is shaping the way information is accessed. For example, as communications costs fall, financial information and news data are being directly accessed by private individuals, whereas hitherto only large media firms and banks were able to afford these sorts of services. Interconnection between machines, which today happens at only a fraction of the rate at which machines "think" will begin to match processing speeds. Co-operative processing will then become more than a pipe dream and the

3 George Gilder, "Into the Telecom", Harvard Business Review. March-April 1991, p. 155.

borders between machines will begin to blur.

Deregulation and Privatization as Important Catalysts

While technology has provided many opportunities for convergence towards a unified INFOCOM industry, these have been thwarted in the past by governmental regulation. But increasingly, governments are favoring de-regulation and competition as a means of promoting overall economic prosperity. It is widely, though not universally, accepted that deregulation cannot be effective in improving the efficiency of the old domestic monopolies without privatization as well. These political forces have had a major impact, in particular, on the communications conduit providers and the infrastructure companies.

In the United States, for example, despite the rapid convergence of computing and telecommunications switching technologies in the 1980s, regulations artificially kept the computer and telecommunications equipment manufacturing industries apart. The divestiture of AT&T and the subsequent changes in US regulation have since removed this barrier.

In Japan and Germany, the national telecommunications companies typically buy equipment from domestic manufacturers. Opening these markets to foreign suppliers can have a significant impact on the domestic economy. For example, following the freeing of the market for telecommunications equipment after the privatization of British Telecom (BT), the UK ran a deficit of $200 million in 1989 on telecommunications equipment trade. In contrast, Germany and Japan, both more regulated markets, had trade surpluses.[4] Privatization of the national telephone companies in these countries will have considerable impact on their historically 'designated' national suppliers as well.

The recent decision by Oftel, the telecommunications regulatory body in the UK, to allow British Telecom (BT) to offer video on demand is bound to hurt the fledgling cable TV industry in that country. It is unlikely that the integration of the broadcast and telecommunications industries that

4 "Joint Ventures in Telecommunications," The Economist Intelligence Unit, Special Report N°2079, January 1991, Figure 1.2 p. 25.

technology has made possible, will proceed smoothly without political intervention. Weaker players in the INFOCOM space will lobby for the retention of regulatory barriers, until such time as they are able to strengthen their own competitiveness.

The projected convergence within the infocom space made possibly by new technology is being facilitated by the forces of deregulation and privatization. However, the pace of this convergence will be moderated by domestic politics. INFOCOM is after all an important industry to all nation states, both for reasons of national security and economic development.

Towards Chaos ?

Chaos, in common usage, means utter confusion or disorder. This "unstable and aperiodic behavior" that is observed in chaotic systems, is actually caused by the dynamic interactions between richly connected systems, each of which may actually be simple and well ordered (Kellert, 1993). In the case of the INFOCOM industry, its complexity (Emery and Trist, 1965) is growing because of the entrance of several new players into each of the industry's major segments and due to the increasing interconnections between them. The dynamics of the interactions between firms is also changing because of the many innovations in the industry. Parts of the INFOCOM industry can, therefore, easily drift towards chaos from time to time.

Growing complexity

As noted in the previous section, technological advances have brought down many of the entry barriers that have historically protected the industries in the INFOCOM space. There has consequently been an explosion in the number of firms seeking to enter each major segment of this mega-industry[5] (see Table 1). In an eighteen month period ending November 1993, 286 new firms had entered a new segment in the INFOCOM space. While a vast majority (nearly 85%) of

[5] Tables 1 and 2 were prepared from the Disclosure Worldscope CD-ROM data base. Only firms whose primary business was in the INFOCOM space are included here. Despite a few inaccuracies and missing data, the database is quite adequate for discerning major trands in the INFOCOM space.

them were new entrants to the industry, the number of firms that had diversified into one or two additional segments of the industry also grew by 30-31%. Since each of the industry's segments are inter-linked, diversifying into additional segments brings a firm in direct competition with one of its erstwhile collaborators.

Motorola, for example, is at once both a supplier of cellular phones and equipment to telephone companies as well as a potential competitor, if the Iridium project it has announced comes to fruition. AT&T sells switches to British Telecom (BT), with whom it also competes aggressively for international telecommunications traffic. In addition, there is a similar breakdown in orderly collaboration within each of the segments. For example, IBM and Microsoft were partners in software development for the IBM DOS and OS/2 but are now competitors. The evolution of this rivalry and its consequences for the microcomputer industry are shown in Figure 3.

The micro-computer industry, or the Personal Computer (PC) industry, was born in the mid 1970s. The first machines were kits that had to be assembled by the home enthusiasts. The industry began to be noticed when Apple, Tandy and Commodore began offering complete machines. IBM did not enter the industry till 1980, by which time Apple had established itself as a market leader with 20% market share. In order to regain lost ground, IBM decided to use the Intel 8088 microprocessor and Microsoft's MS/DOS operating system for its PCs. It also subcontracted the application software work for its PCs to independent software vendors (ISVs). In hindsight, what were then perfectly reasonable decisions for a smart and powerful follower like IBM had unintended consequences that altered the competitive dynamics of the industry to IBM's detriment.

The IBM PC soon became the industry standard, but IBM's decision to allow both Intel and Microsoft to supply critical components and software to other manufacturers gave birth to the IBM "clones". It should be noted that the rationale for the decision at the time appeared sound. Without other manufacturers helping to grow the number of installed machines to a point where it rivalled Apple's installed base, IBM might never have made up the ground it had already lost to Apple by being late to the market. As the price of PCs started dropping more users flooded the

market. This in turn encouraged Intel, Microsoft and the independent software vendors to set an ambitious development strategy, increasingly independent of IBM. The availability of user friendly applications further boosted the sale of PCs, but now the hardware itself had become a mere commodity. The profits had migrated from hardware manufacturers to suppliers like Intel and Microsoft, as well as to distributors like Dell. As Figure 3 shows, the PC world is filled today with multiple, inter-linked players, each betting that its next innovation will further boost the industry's demand and give it at least a temporary competitive advantage before the next innovation comes along. This virtuous cycle of demand expansion through constant innovation has had another unintended consequence for IBM. The PC technology has reached a stage where a network of PCs provides a competitive substitute for many mainframe applications - thus challenging an IBM speciality.

The IBM story illustrates the first source of instability in the INFOCOM industry. Like the PC industry that is subsumes, INFOCOM is a positive feedback industry. It does not follow the classic life cycle. Information and communications are two needs that cannot be easily satiated. Industry demand expands with every new innovation. For example, the experience of cellular communications operators suggests that this new service did not cannibalize existing wireline services, but rather it expanded the usage of telephone services. This is not to suggest that there will be no over-capacity in the industry. With four competing broad band conduits: telephone, fibre optic cable, satellite and cellular, often fighting for the same subscriber, there are bound to be pockets of over-capacity. This may result in a price war. The more likely scenario is a continuous jostling for supremacy, using both cost and features as weapons in this fight (Porter, 1980). Competitive advantage will be fleeting (D'Aveni, 1994).

The second source of instability is the growing inter linkages between firms in the INFOCOM industry. As Table 1 demonstrates there are 17 firms as of 1993 that operate in three INFOCOM segments. Table 2 shows the diversity of INFOCOM firms that had over a billion dollars of turnover in 1993. As shown in Table 1 this diversity is growing rapidly. Figure 4 shows the recent moves of Microsoft, a firm having its home in the infrastructure segment that supports the information content providers. Its recent alliances with Sega, the video game manufacturer, and

PacTel, the telecommunications conduit provider, makes Microsoft a player in three of the four major segments in the INFOCOM space. Another firm, AT&T is also in three segments. It is a manufacturer of telecommunications equipment and computers (through its acquisition of NCR), as well as a provider of telecommunication conduits. Firms like Microsoft and AT&T will have multiple relations with other firms in the industry, sometimes as collaborators and at others as competitors.

Until the two companies fell out over the development of OS/2, IBM was Microsoft's largest single customer. But in launching Windows before OS/2 was released, Microsoft set out to protect DOS sales long enough to develop a competing product to OS/2 (Windows NT). Some of Microsoft's developers working on the OS/2 project stated in the press that they believed that the Windows development effort was given excessive focus to the detriment of OS/2. Given the delays in OS/2's launch, Microsoft's strategy, if that is what it was, might be viewed as successful. In a fast moving market where de-facto product standards are established and exploited within the space of as little as two years, causing an 18 month delay is more than enough to put the competitor's product out of contention. As the Microsoft-IBM example, illustrates it is not easy for all players to collaborate and win (Hamel, Doz and Prahalad, 1989). Even as the linkages between firms in the INFOCOM space expand, many of the alliances will be tenuous - once again adding to the industry's instability.

Innovation dynamics

Added to the growing complexity of the INFOCOM industry is the accelerated speed with which new products and services are being introduced in the market. The digitization of information allows for several creative ways in which the content providers can add value (see Figure 5). Some have focused on speed. There are now a plethora of alert services that provide near instant business intelligence on a wide range of items from stock market performance, patent and other scientific information to even presentations at public conferences. Others have based their innovations on customizing information. Textbooks are now being tailored to suit the individual preferences of instructors. Electronic newspapers combine both speed and customization.

Finally, we are also witnessing a number of innovations that seek to extend the half-life of information i.e. how long it is valued, through a range of archival products from technologically "freshened" entertainment classics to new data bases stored conveniently and inexpensively on CD-ROMs for personal use.

Innovation in the INFOCOM industry has not been restricted to the information content segments alone. There have been a number of innovations aimed at improving the value of the communications conduits as well (see Figure 6). The value of a conduit is enhanced if it can be made specific to an individual. Satellite broadcasting, for example, is a one-to-many communications conduit that is not specific to any viewer. However, through the use of antennas and decoders, individual subscribers are being reached on a more targeted basis. The other desirable characteristic in a conduit is its versatility. This refers to the conduit's ability to carry all forms of information; voice, data/image, and video. While satellite transmission is extremely versatile, the conventional telephone conduit is not. It was primarily designed for voice transmission. However, technological advances have given it the capability to handle date/image transmission, and more recently even video signals using new signal compression technologies. The investment of telephone companies in fibre-optic cables and high speed digital switches capable of B-ISDN and ATM transmissions should allow them to offer shortly a fully versatile conduit as well. Cable TV is a third conduit alternative. It offers specificity and versatility, but does not have interactivity, the third important attribute in a conduit. A conduit is interactive when it allows two way communication. This is not an inherent limitation of the cable network per se, but is due to the lack of necessary broad band switches in the network and suitable communications equipment in the home. The fourth conduit is radio transmission or cellular transmission as it is popularly called. This is the most specific of the four conduits. The communications link with the subscriber is mobile, wherever she chooses to be - at work, home, or in the car. It is the dream of the cellular communication providers to keep this access number the same no matter where in the world the subscriber chooses to live. Cellular radio communication is also interactive but its versatility is somewhat limited. Teledesic, a joint venture between PacTel and Microsoft is a low earth orbit (LEO) project that will use 800 satellites (more

than the number currently in orbit) to provide a high bandwidth global business communications network. By tying the cellular capabilities of PacTel to satellite communications technology, the venture hopes to offer a viable fourth high band-width conduit to the global business community.

Coping with chaos

The changing dynamics and growing complexity of the INFOCOM industry will lead parts of it to a near chaos state from time to time (Gordon, 1992). Contrary to extant views (Porter, 1980) in the literature, it will be increasingly difficult for any single firm to influence the INFOCOM industry's evolution in ways favorable to it. There are several firms in the INFOCOM space with deep pockets. Large infrastructure firms like Alcatel or Sony, will try to retain bulk of the value added and to commoditize the services of their customers, the conduit providers. A large conduit provider like BT will obviously try to commoditize the products sold by its suppliers. A similar battle will be waged between information content providers and their infrastructure suppliers. Given the vast resources of the firms involved and what is at stake, these battles are likely to be protracted. The lingering role of regulation in mediating this dynamic competition is another wild card that makes any predictions on the industry very difficult. It is clear, however, that conventional industry analysis tools and the associated strategy advice (Porter, 1980) will not be adequate to cope with the INFOCOM industry's competitive environment - imagine several hundred five-force constellations interacting with each other dynamically over time!

It is precisely to deal with the dynamics of competition, concepts like Strategic Intent (Hamel and Prahalad, 1989) and Core Competence (Prahalad and Hamel, 1990) have been advocated recently. The next section examines the relevance of these concepts for competing in the INFOCOM space.

Commitment and Rigidity

In two very influential articles Prahalad and Hamel offer a provocative challenge to the top management of companies faced with a hostile environment. Instead of "fitting" strategy to

available resources, they urge top management to commit their companies to "heroic goals - goals that lay beyond the reach of planning and existing resources." The stretch in this strategic intent, when backed by a sequence of well planned challenges, control and rewards, can lead to innovative strategies and new capabilities. A complementary top management effort has to be in consolidating corporate wide technologies, know-how and skills into core competencies that empower individual businesses to adapt quickly to changing opportunities.

Strategic intent and core competencies are also clearly at the heart of D'Aveni's (1994) recommendations for competing in what he calls a "hyper-competitive" or a dynamically competitive environment. D'Aveni's prescriptions include: understand how to satisfy customers, seek out new knowledge for predicting or even creating new windows of opportunity, develop the capability for disrupting the competitor's position through speed and surprise, shift the rules of competition, signal strategic intent and orchestrate simultaneous and sequential strategic thrusts to destroy the advantages of a competitor.

The above summary clearly does not do justice to these innovative ideas. The purpose here, however, is not to rehash what are popular ideas in the literature. Rather, this section seeks to evaluate critically the relevance of these ideas to the competitive realities of the INFOCOM space.

Strategic Intent in Near Chaos Environments

Strategic Intent is a statement of a desired leadership position and the criterion the organization will use to chart its progress. Komatsu's war cry "Encircle Caterpillar", or Canon's "Beat Xerox" are simple but elegant examples of strategic intent. Underneath these statements is a clear industry benchmark for quality, reliability, product range, sales and service, that both Komatsu and Canon used to chart their progress. Both Caterpillar and Xerox obliged their Japanese foes by staying their course, becoming sitting ducks in the process. Of course industries do not evolve in this leisurely and linear fashion, nor will incumbents sit still for as long as Caterpillar and Xerox did. Even these dinosaurs have since shown surprising agility and have come back strongly to hold the advances of Komatsu and Canon and even regain some lost ground.

While the David and Goliath theme to the Komatsu-Caterpillar or Canon-Xerox stories makes them immensely appealing to managerial audiences, the competitive innovation of the kind implied in these stories is perhaps less relevant to the INFOCOM industry. Consider two critical elements of such an innovation: searching for loose bricks or changing the terms of engagement.

Komatsu, we are told, identified cost as a key weakness of Caterpillar. Cat was heavily vertically integrated, suffered a raw material, labor cost and exchange rate handicap because it manufactured primarily in the US and had 30% of its capacity reserved for rush orders and thus un-utilised at other times. Komatsu, of course, out sourced a lot more, thus kept its own capacity utilization high, used cheaper Japanese steel and labor and benefited initially from the strong dollar. As for Canon, it identified a few additional loose bricks in Xerox's strategy: lack of attention to medium and small sized businesses, a fixation with centralized copying and a bundled service offering that may have hurt product reliability. By dismantling these loose bricks, Komatsu and Canon first entered special niche segments and then went on to attack their enemies in all market segments. The problem with the fortress wall analogy is it assumes that its structure will still be intact when the loose bricks are pried away.

Witness what happened when MCI tried to encircle AT&T and dislodge a loose brick, long distance telecommunications for business customers. Little did it anticipate that its actions will cause the whole fortress wall of regulation to come tumbling down. Perhaps still less did it expect AT&T's top management to opt for the world of competition in the long distance market over the more comfortable local loop monopoly. AT&T spun off the Baby Bells rather than its long distance and international businesses. The "freed" Goliath, AT&T, thus became the nemesis of MCI.

Many of the INFOCOM niches still have lingering regulation protecting them. The post deregulation behavior of the firms protected by these barriers is hard to predict. Companies like AT&T, BT (British Telecom) and many of the RBOCs (Regional Bell Operating Companies in the US), have proven to be far more fiesty competitors than earlier predicted. In regulated industries there is no reliable data on the lethargy of incumbents.

Also, the fortress wall analogy suggests that the battle will be fought on the ground. Even though both Komatsu and Canon changed the terms of engagement, these were largely benchmarked around the quality, reliability and product variety of the industry leaders: Caterpillar and Xerox. The Komatsu and Canon innovation, at least initially, was to offer the same or reduced functionality but at substantially lower prices than the industry leaders. In contrast, the innovations in the INFOCOM space are aimed at brand new functionalities. Take for example the Iridium project of Motorola or the Teledesic project of Microsoft and PacTel. Iridium is a narrow bandwidth global personal communications network being championed by Motorola in alliance with a consortium of local telephone companies. It will be accomplished by using 66 Low Earth Orbit (LEO) satellites with complementary earth stations and local loop access. The second, Teledesic, is the joint venture described earlier between PacTel and Microsoft. Neither Iridium not Teledesic have ready benchmarks. Unlike the Komatsu and Canon innovations, these are revolutionary. They do not merely seek to change the terms of engagement, but are attempts to redefine the engagement itself. Quite literally the competitive battle will no longer be fought on the ground.

Strategy intent is perhaps a far more useful concept for industries that evolve slowly and in more predictable ways. The complexity and dynamics of the INFOCOM industry is likely to either reduce the concept into a vacuous abstraction or worse still commit the firm to climbing the wrong set of hills. There is a growing chorus of INFOCOM CEOs, including Andy Grove of Intel and Lou Gerstner of IBM, who question the value of defining a strategic intent for their firms. Andy Grove confessed recently that Intel's past stated intent of being a major player in both memory chips and micro-processors was quickly undermined by fast changing competitive and market conditions (Nanda and Bartlett, 1994). Intel is not in DRAM and SRAM businesses today. Even if a strategic intent is stated, it cannot be enduring. The near-chaos conditions of the INFOCOM industry make the systematic pursuit of strategic intent difficult.

The other risk with an enduring strategic intent is that it can commit the company to the wrong path. Even in the case of the much cited Komatsu story, Bartlett and Ghoshal (1994a) report that its new CEO, Tetsuya Katada, when he took charge of the company in 1989 was alarmed that

Komatsu's management had become so obsessed with Cat that it had stopped thinking about its own strategic choices. They describe how Komatsu had started chasing Cat for market supremacy in the high end bulldozers rather than smaller, lower priced products like hydraulic excavators where market demand was growing. The very strength of strategic intent, i.e. the mobilization of the personal effort and commitment of an organization's employees, can be a major source of inertia when companies have to compete in the near-chaos environment of the INFOCOM space. Consider, for example, the case of NEC - another company often cited for its clear strategic intent.

NEC articulated in the early 1970s its strategic intent to exploit the convergence of computing and communications, what it called "C&C". Its recent financial problems notwithstanding, the company can brag about its impressive achievements under the C&C umbrella. The company was ranked in 1993 as second only to Intel in world-wide semiconductor sales, fourth in world-wide computer sales, and sixth in telecommunications equipment sales. But the company is still not a leader in integrating computers and communications. Inter divisional conflicts and a protracted power struggle at the top are claimed to be the reasons for this failure. These organizational problems are being currently fixed. But even assuming that NEC gets back on track as a C&C company, the question is whether that is the right hill to climb in today's INFOCOM environment.

NEC is primarily a hardware company. The C&C strategy rests squarely within the two infrastructure segments of the INFOCOM industry (See Figure 4). These segments of the INFOCOM industry are going to get even more competitive as computer, telecommunications equipment and consumer electronics manufacturers try to invade each others' markets. For example, despite the billions of yen that NEC has poured into the development of the new asynchronous transfer mode or ATM switches, the fight for the ATM market has been joined by other giants like Fujitsu, IBM, AT&T and Northern Telecom. With the exception of AT&T none of the others have been profitable recently. Even in the case of AT&T, its profitability comes not from its own version of C&C (through its NCR subsidiary), but rather through its dominating presence as a global communications conduit provider. While other successful infrastructure firms like Microsoft or Sony seem to be actively establishing strategic options outside the infrastructure segments (see

Figure 4), NEC seems to be barreling ahead with its C&C mission. While it is true that having some map is better than having no map at all when faced with an ambiguous situation (McCaskey, 1982), there is no guarantee that this map will lead to competitive success. Instead of being enduring, strategic intent has to be flexible. This of course would dilute the commitment of the organization as well. But then competing in near-chaos environments like the INFOCOM space calls for flexible commitments.

On Core Competitiveness and Core Rigidities

As noted earlier the core competency of a firm is the collective and distinctive know how and skills that it has embedded in its organization. Core competency provides the basis for accessing a wide variety of markets and contributes significantly to the perceived customer benefits of the firm's end product. IBM, arguably, has several core competencies. But these are mostly anchored in the manufacturing, sales and service of large mainframes. While it enjoys unrivalled superiority even today in the mainframe market, its overall performance has suffered because these competencies are not very relevant to the exploding microprocessor market. Even in the case of Caterpillar and Xerox, their misfortunes were not due to the fact they had no core competencies at all but because these had been made less relevant by aggressive competitors like Komatsu and Canon. This is precisely what was referred to earlier as competing through changing the rules of engagement. The core competencies of a Caterpillar or Xerox became core rigidities (Leonard-Barton, 1992) when their rivals introduced a new competitive strategy to the marketplace. But then should the eventual success or failure of a strategy be the determinant of whether we call the collective and distinctive know how and skills of an organization as its core competency or core rigidity? In the fast changing environment of the INFOCOM industry, in particular, core competencies can quickly become core rigidities. Having a portfolio of competencies and renewing them periodically is the desired compromise.

Sony seems to be pursuing an approach that diversifies its portfolio of competencies. Having made its mark earlier in the consumer electronics industry, by repeatedly leveraging its core competence in miniaturization, it has since started building additional competencies that are vital

to its success in the INFOCOM space. Sony's CEO Norio Ohga notes[6]:

> We are coming upon a very important era. It will no longer be enough to concentrate solely on hardware.

Sony purchased CBS Records Inc. in 1988 for $2 billion, and a year later purchased Columbia Pictures Entertainment Inc. for $3.4 billion. It has recently announced an electronic publishing arm to sell electronic games and all manner of "multi-media" software. The archival value represented by these acquisitions is significant, but do not justify the prices paid. As suggested in Figure 5, Sony must also build the competencies required to customize and speed up the production of information in these companies. It has recently reorganized its film, music and electronic publishing businesses under one umbrella, the Sony Software Corporation. Given the competitive advantage of the United States in these businesses (Porter, 1990), Sony has based this new company in US under an American president.

Just as it is necessary to add new competencies, it is equally important to retire old competencies that are no longer relevant to the changing needs of the market place. Folklore has it that Cray Research, the leading super-computer manufacturer, has a ritual in which the design manuals for each generation of machines are ceremoniously burned before launching the next generation. The rationale for the ceremony is that the old skills and know-how would certainly not be relevant for producing the next generation of machines. These "little deaths", as McCaskey (1982) calls them, are a vital part of the competence renewal process. Rupert Murdoch, the media mogul, is rapidly recasting the competence base of his company, News Corporation, from print media to electronic media. In the process he has divested his stake in profitable properties like the South China Morning Post. Committing to building a tight core competence architecture clearly can be very beneficial provided there is reasonable certainty on the evolution of the industry. When industry evolution is not just uncertain but ambiguous, as in the case of the INFOCOM industry, commitments have to be flexible (Ghemawat, 1991). The primary emphasis therefore has to be on the periodic renewal of a firm's core competencies, even with the attendant risk of loss of financial

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6 As reported in "Media Colossus: Sony is out to be the World's One-Stop Shop for Entertainment", Business Week, March 25, 1991, p64

performance. If commitment is necessary for financial performance, flexibility is a must for long term survival.

Flexible Commitments

The ideas in this section are speculative. They are based in part on the action research that is on-going in four companies, one each in the four segments of the INFOCOM space (see Figure 1). These projects clearly question whether strategic intent and core competencies have un-intentionally become the panaceas of the 1990s, just as portfolio planning had in the 1970s or the Porter's five force model in the 1980s. Each approach is valid, but in its own context. What is presented next is a framework that seems to relate more closely to the challenges of coping with the near chaotic environment of the INFOCOM industry.

In the 1960's when Emery and Trist (1965) wrote their seminal paper on the causal texture of organizational environments, they described an industry context similar to the one described in this paper. When the organization set (Evans, 1966) of a firm starts expanding, as it has in the INFOCOM industry with the entry of several new potential competitors and collaborators, its environment becomes more complex. Technological changes and deregulation have also reduced the routineness (Miles, 1980) of the INFOCOM environment, making orderly conduct among members of a firm's organizational set more difficult. The growing complexity and changing dynamics make the INFOCOM industry's environment turbulent (Emery and Trist, 1965). Of course firms may avoid parts of their environment that are tending towards turbulence or erect suitable buffers to shield them from this turbulence. Miles and Snow (1978) described such a strategy as a Defender Strategy. However, as the threat of turbulence starts spreading to more and more segments of an industry, as it has in the INFOCOM case, an avoidance or a defensive strategy is not viable except for the really small niche players. This paper proposes an approach for coping with turbulence, or chaos as it is called here.

The framework is titled, flexible commitments. This is an oxymoron. Commitment connotes persistence whereas flexibility refers to change. Combining the two harkens back to Bourgeois

and Eisenhardt (1988). They studied the microcomputer industry, where they noted then that "the rate of change was so extreme that information was so often of questionable accuracy and was quickly obsolete". Since then the INFOCOM space has become a lot more dynamic and complex. Based on their field investigation of four firms, Bourgeois and Eisenhardt discovered a series of paradoxes which successful firms resolved: (i) to make strategic decisions carefully, but quickly; (ii) to have a powerful, decisive CEO and a simultaneously powerful top management team; and (iii) to seek risk while executing a safe, incremental implementation. Coping with chaos requires the management of these and other paradoxes.

One way to cope with chaos is to create chaos

In a recent interview[7], Edward R McCracken - the president of Silicon Graphics presents the philosophy of this highly successful billion dollar, "visual computing" firm:

> "The key to achieving competitive advantage isn't reacting to chaos; its producing that chaos. And the key to being a chaos producer is being an innovation leader".

This is a simple but powerful philosophy. There is relative tranquillity where a chaotic process first starts. Like in a hurricane, the best place to be is in the eye of the storm.

The above suggestion would seem to fly in the face of past theorizing on first mover advantages (Lieberman and Montgomery, 1988). In their thoughtful survey on first movers advantages (and disadvantages), the authors note that a first mover strategy has severe disadvantages when there is the possibility to 'free-ride' on an innovation, the technological and commercial uncertainties are high, and technology or customer needs are fluid. This is in fact the setting of the INFOCOM industry. The growing inter-linkages in the industry is forcing the opening of standards and the enhanced possibility of cloning. An example is the 'free-rider' problem confronted by IBM in its PC business. Technology is changing rapidly, and the number of "deep pocket" competitors entering the industry also heighten the uncertainties in the industry. And yet, as McCracken observes the sensible strategy is indeed to be a first mover. Despite its disadvantages, being a first

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[7] Steven E Prokesch, "Mastering Chaos at the High-Tech Frontier: An Interview with Silicon Graphics', Ed McCracken", Harvard Business Review, November-December 1993, p136

mover is better than its alternatives in a chaotic environment. The window of opportunity is extremely small, and if a firm is not positioned close to it and often enough, its very survival is at stake (D'Aveni, 1994).

A clear vision is necessary, but don't manage it actively

In the example cited above, the vision of Silicon Graphics is that the computer screen will in the near future be a window into a virtual world. Unlike strategic intent, this vision is not specific. There are no explicit or implicit enemies who have to be vanquished on the way to accomplishing this vision. The vision merely states an industry scenario that the company is willing to bet on. It is meant to guide the direction in which employees should look for opportunities, i.e. in visual computing. Whereas a strategic intent is an actively managed process, a vision is not. It does not commit the company to any course of action.

In near-chaos environments, an actively managed strategic intent can be stifling. Witness for example the recent problems of NEC. It has identified the lack of in-home entrepreneurship as a major problem in the pursuit of its "C&C" intent.[8] NEC may have the causality wrong here. Perhaps if "C&C" was not as tightly managed a process at NEC as it appears to be, the firm might have encouraged its managers to be more entrepreneurial. An internal report mentions a "vicious cycle" where even the smallest decision is made in Tokyo. NEC managers in the US, which is clearly the hot bed of many of the INFOCOM innovations, have not had the autonomy to be opportunistic.

In order for a firm to be a chaos generator, entrepreneurship should be directed at future windows of opportunity. But these windows cannot be preset within a strategic architecture. The turbulence of the INFOCOM industry threatens the durability of any such architecture. The looser guidance of a vision is perhaps more appropriate. The stretch in the organization comes not from its vision, but from the turbulence of its environment. Fighting for survival provides the stretch in a turbulent environment, that strategic intent provides in other environments.

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[8] "We need more entrepreneurs", Forbes, December 6, 1993, p 132

Nurture entrepreneurship, but manage knowledgeably from the top

In order to respond quickly to market opportunities, each of the firm's businesses must be empowered. Companies like GE and ABB (Tichy & Sherman, 1993, and Bartlett and Ghoshal, 1994b) have shown how it is possible to inculcate entrepreneurship even in large diversified global corporations. The more difficult challenge is to manage this entrepreneurial network for coherence. A vision led strategy making process, described earlier, can be very opportunistic but can also lead the firm into disconnected markets where it has no shared competencies. There are a couple of approaches that firms have used to manage this problem.

In the case of ABB and GE, the requisite knowledge to guide the bottom-up strategy making process resides in the executive committee. Members of this committee collectively bring deep business knowledge on all of the products, processes and geographies in which the firm seeks to participate. Each member of the committee manages a family of entrepreneurial businesses, and is thus able to steer them in the right direction when necessary.

In the case of the INFOCOM industry, it is additionally necessary for the CEO to be well versed in the relevant technologies. George Fisher, the former CEO of Motorola and currently the CEO of Eastman Kodak, notes[9] how important technology awareness is in managing an INFOCOM business:

> "I don"t see how anybody could deal with the subjects I deal with over a daily basis - RISC processors, DRAM technology, cellular systems, paging - without a deep immersion in the technologies. It almost has to be second nature."

In an industry that is being transformed by technology, strategic decisions will invariably have a big technology component to them. Fisher talks about Motorola's alliance with Toshiba:

> "We exchange some of our semiconductor technology for their help in gaining market share in Japan. That's a case where a technology background was critical to making a sound business decision. You can't understand whether an agreement is a technology give away if you don't really understand the technology: where it's been, where it's going, what kinds of investements are required to stay current, the different lifecycles of microprocessors and memories, the nature of the software".

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9 "Customers Drive a Technology Driven Company", An Interview with George Fisher, Harvard Business Review, November-December, 1989, p110

Whereas knowledge at the top can provide guidance, it cannot guarantee success.

Commit resources, but always with a recourse

Traditional strategy analysis focuses on positioning and sustainability - positioning refers to the manner in which a firm chooses to compete in its industry, and sustainability is the ability of the firm to defend its strategy (Ghemawat, 1991). A strategy is sustainable if it is defended by an asset stock that is difficult to procure, imitate or substitute (Dierickx and Cool, 1989). The concept of core competence (Prahalad and Hamel, 1990) extends this view by arguing that it is not assets per se that provide sustainability, but rather the organizationally embedded know-how and skills that are collectively shared within the firm. Building core competencies and layering them on top of each other may provide enduring advantage, but also call for major resource commitments. Ghemawat (1991) argues that in ambiguous environments, like that witnessed in the INFOCOM industry, commitment without the room for subsequent revisions (and even abandonment) can be dangerous. He captures the trade-off in what he calls the ratio of the learn rate, the rate at which useful feedback, is received on whether the chosen course of action is the right one, and the burn rate, the rate at which commitment to the chosen course of action is piling up. Strategic investments in support of innovative strategies and the competencies required to sustain them should be acceptable only as long as the ratio of learn rate to burn rate is high. Structuring investments in stages with an exit at each stage seems like a simple idea. But the process of planning, control and rewards within INFOCOM firms may need major revision (Chakravarthy and Lorange, 1991). An investment stream that is designed for flexibility is typically more expensive, even though the added expense should not be viewed as investment per se but rather as the price of buying an exit option at various stages of the investment stream. Standard capital budgeting techniques do not capture this nuance. Consequently, capital budgets that build-in flexibility are either screened out or pruned down to remove the extra costs for building in options. In the former case, the firm looses the opportunity to partake in a new opportunity and in the latter case it commits itself to a course of action with no recourse for exit.

A related issue to the planning and budgeting discussion above is the design of a suitable control

and incentives system. The typical control system that is used in companies is what is called steering control, (Newman, 1975). The attempt is to steer the performance of a business close to its budgeted goals through periodic negative feedback. In contrast, what a few INFOCOM firms have started experimenting successfully with is called go-no go control. The project is structured in stages, with the earlier stages providing a continuous assessment of the project's viability. If the early readings are unfavorable, the project is abandoned regardless of the sunk investments. Of course, when this happens the managers involved with the abandoned project have to be rehabilitated and even rewarded when their personal efforts warrant it. Without an administrative context that allows for errors in judgment and encourages learning from them, it will be difficult for the firm to make the quick commitments that are necessary to be a first mover. Flexibility is retained by structuring exit options in the investment stream.

An Emerging Framework

This paper examined critically the utility of extant frameworks, popularized by Porter (1980), Hamel and Prahalad (1989) and Prahalad and Hamel (1990), for coping with the turbulent context of the INFOCOM industry. INFOCOM is but one example of the growing convergence between erstwhile separate industries. Financial services, health care, and transportation are other examples where industry boundaries are disappearing, prompted by forces of technology, deregulation and global competition.

When the number of players in an industry expands because of falling entry and mobility barriers and they begin to link up in varying patterns both as competitors and collaborators, the evolution of the industry is no longer predictable. The rapid pace of innovation in these mega-industries makes it difficult to plot their evolution. This paper suggest that the extant frameworks (see Table 3) may assume a far simpler industry environment. While the Hamel and Prahalad (1989) framework is an improvement on Porter's 1980 framework, in that it explicitly introduces innovation dynamics to industry evolution, it still assumes that this evolution can be managed. The discussions in this paper suggest that this is not a reasonable assumption to make in the context of the INFOCOM industry, which is both complex and dynamic.

The concept of strategy for dealing with the near chaos environment of INFOCOM, and other emerging mega-industries like it, should not rely merely on changing the rules of the game but on changing the game itself. This is the notion of creating chaos to cope with chaos. Abernathy, Clark and Kantrow (1983) offer a concept called the transilience of an innovation. Transilience is high when an innovation can make obsolete both the productive systems and market linkages associated with a business. The early Timex watch strategy is an excellent example of a high transilience innovation. Through the use of mass production technology and mass distribution, the Timex watch successfully challenged the rules of the game that were set up by the dominant player at that time - the Swiss watch companies. Note how an innovation can have high transilience, even when it is not associated with any invention. Timex did not invent either mass production or mass distribution - it merely adapted these cleverly. For competing in near chaos environments, in addition to high transilience innovations, the firm must be capable of inventions as well. The successful players in the INFOCOM industry, like AT&T, Intel, Microsoft and Sony, are known for their inventions. They do not merely seek to serve existing customer needs in innovative ways but to also create new needs through their inventions.

But being inventive and innovative at the same time can be very difficult and risky. Invention has been often compared to mountain climbing. It is a lonely sport and the rewards take a long time to accrue. On the other hand, innovation is more like rugby. It requires a team effort and the rewards are more immediate. Being inventive and innovative at the same time is like playing mountain-rugby! The strategy process must allow for timely exits if the earlier investment commitments do not confirm the rich prospects that were originally foreseen for the project. The basis for competitive advantage is not in erecting barriers or in the layering of core competencies, but rather in making flexible commitments.

The process suited to the new environment has to afford considerable autonomy to front line business managers. It is more bottom-up than conceived either by Porter (1980), the Komatsu and NEC cases discussed in this paper point to the real dangers of strategic intent degenerating into a similarly stifling top-down process. It is worth reverting back to the Canon story in this context. The strategic intent of Canon may have been "Beat Xerox" when it first entered the

photocopier industry, but then it progressively gave way to more ambiguous intents like being a "Premier Japanese Company (1975)", "Premier Global Company (1981)", and "Premier Global Company of the Size of IBM combined with Matsushita (1991)". Also, the many distinctive competencies that Canon has built over the years, seem to be aimed at competence renewal rather than on layering existing core competencies. The company has shown great courage in cannibalizing its own competencies, as for example in the case of laser printers. It is now focusing its commitments on digital imaging, gradually replacing its competencies in precision mechanics. Canon may actually be a good example of the value of a softer vision and opportunistic competence renewal that the proposed framework emphasizes.

Finally, the approach proposed here has an important implication for the role of top management. Top management cannot clearly play the role of a strategist - only the front-line business managers really know what is going on in a fast changing industry. But it cannot also detach itself from the business. The new industry environment calls for a more hands-on management style. Unless top management has the necessary industry knowledge and technology awareness, it cannot play its required role of coach and counsellor effectively. Developing these specialist-general managers is yet another paradox that the INFOCOM firms must learn to deal with.

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Table 1

Growth trends among INFOCOM firms

INFOCOM segments	Number of firms		
	in Apr 92	in Nov 93	Increase
3 segments	13	17	31%
2 segments	132	171	30%
1 segment	753	996	32%
Total firms	898	1184	32%

Table 2

Diversity of INFOCOM firms with a turnover of over $1 billion in 1993

Primary activity	Secondary activity	Content		Conduit	
		Providers	Infrastructure	Providers	Infrastructure
Content	Providers	150	8	16	3
	Infrastructure	2	120	1	13
Conduit	Providers	5	5	71	5
	Infrastructure	1	20	5	77

Table 3
Contrasting the Various Approaches to Strategy

	Porter (1980)	Hamel & Prahalad (1989) Prahalad & Hamel (1990)	This Paper
1. Industry Context	Low Systematic Complexity Static	Low systematic complexity Dynamic	High systematic complexity Dynamic
2. Concept of Strategy	Fit Strategy to industry environment	Change rules of the game	Change the game-create chaos
3. Primary driver of Strategy	Strategic plan based on competitor analysis	Strategic Intent and an actively managed administrative process	Vision coupled with bottom up entrepreneurship
4. Basis of Competitive Advantage	Entry and Mobility Barriers	Core Competencies	Commitments and exit options
5. Locus of strategy making	Top management	Top management	Business management
6. Role of top management	Strategist	Strategy Architect	Coach and Counsellor

Figure 1

The major constituents of the INFOCOM industry

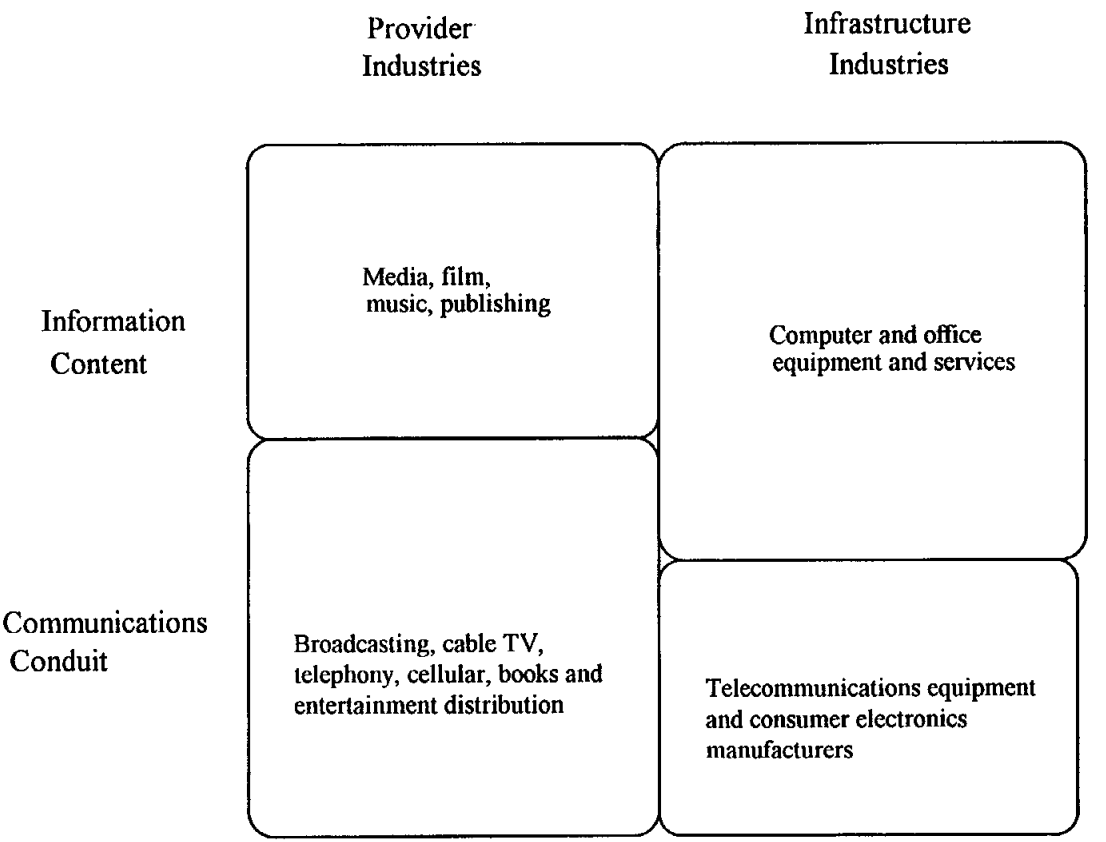

Figure 2

The four segment classes of the INFOCOM industry

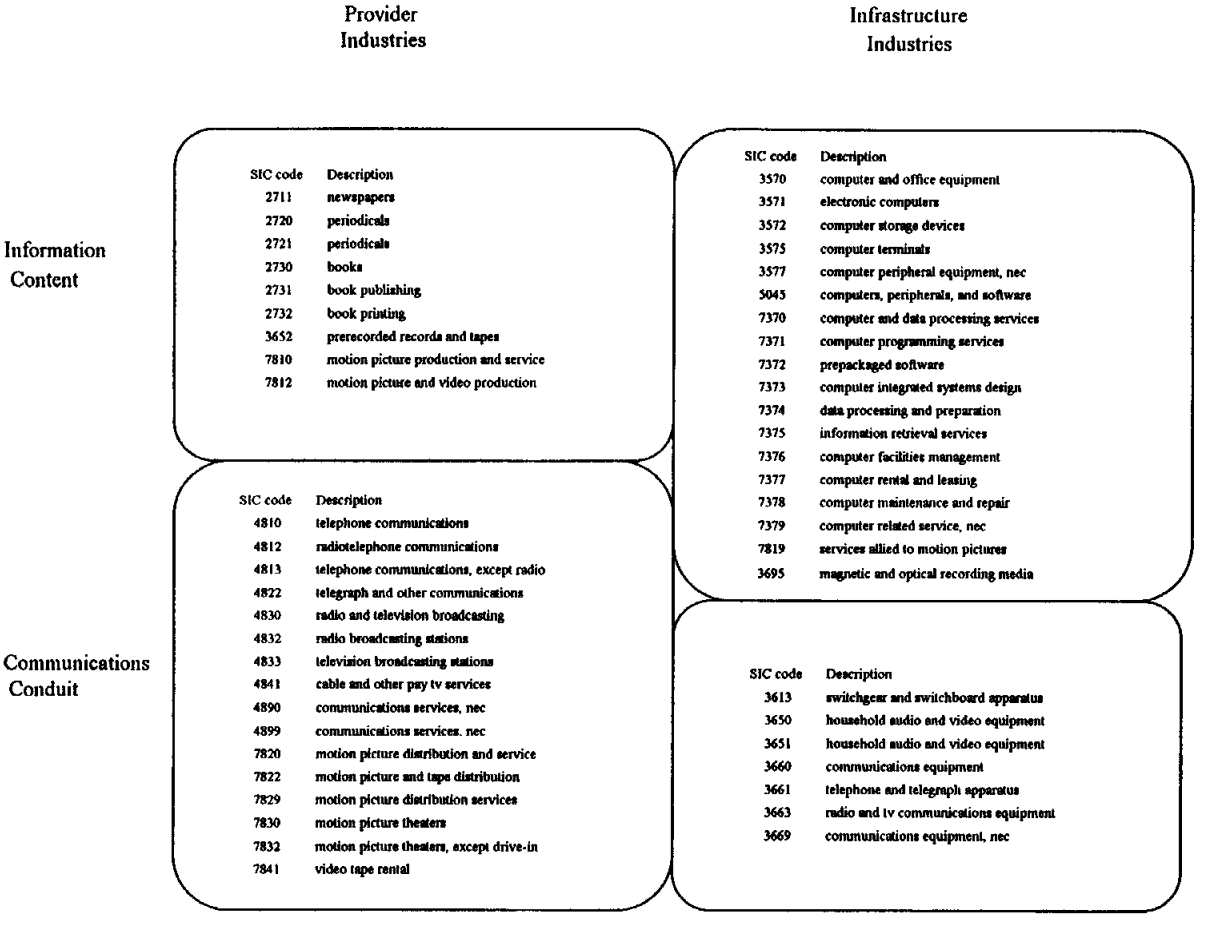

Figure 3

Evolution of the PC industry

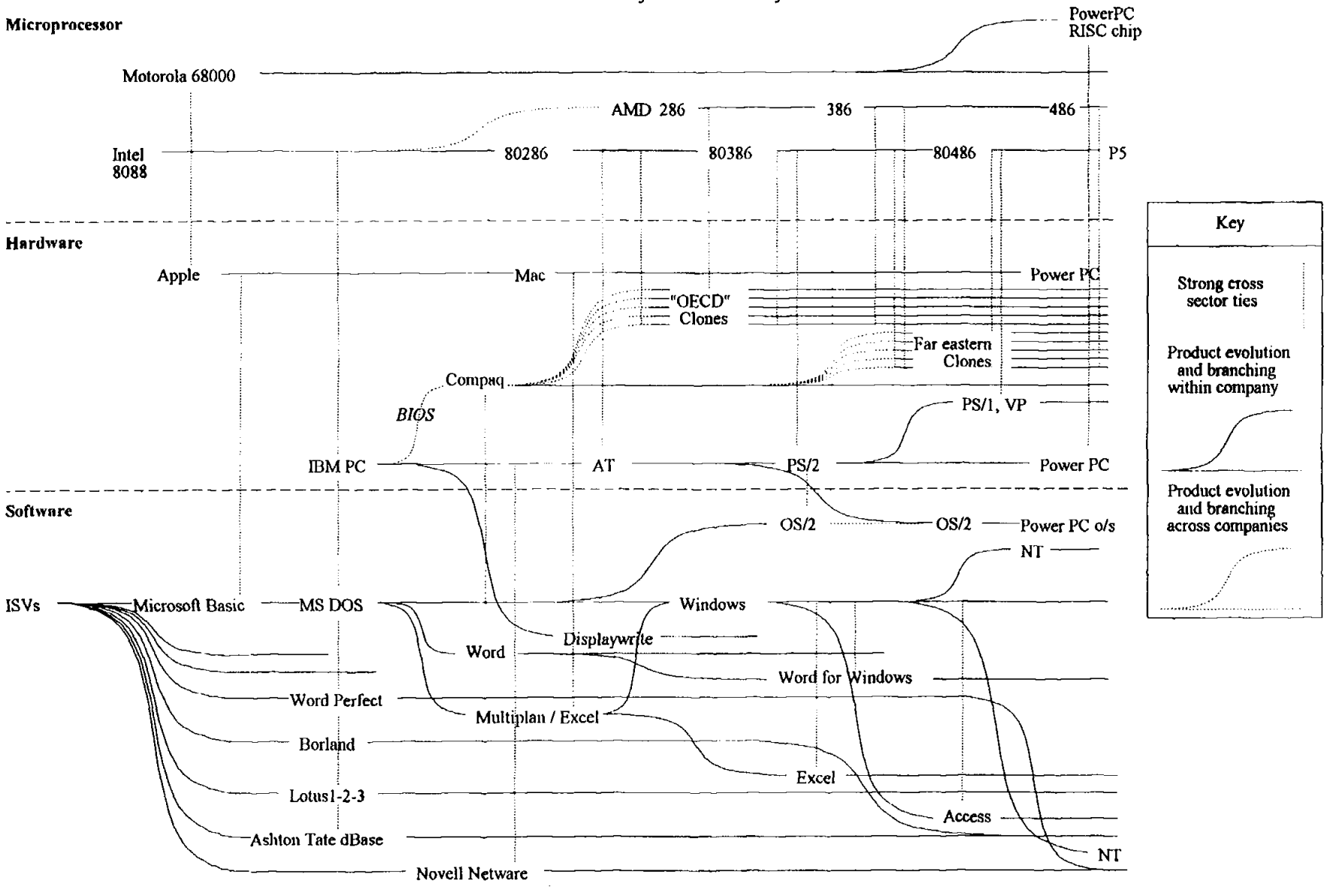

Figure 4

Recent moves by firms in the INFOCOM industry

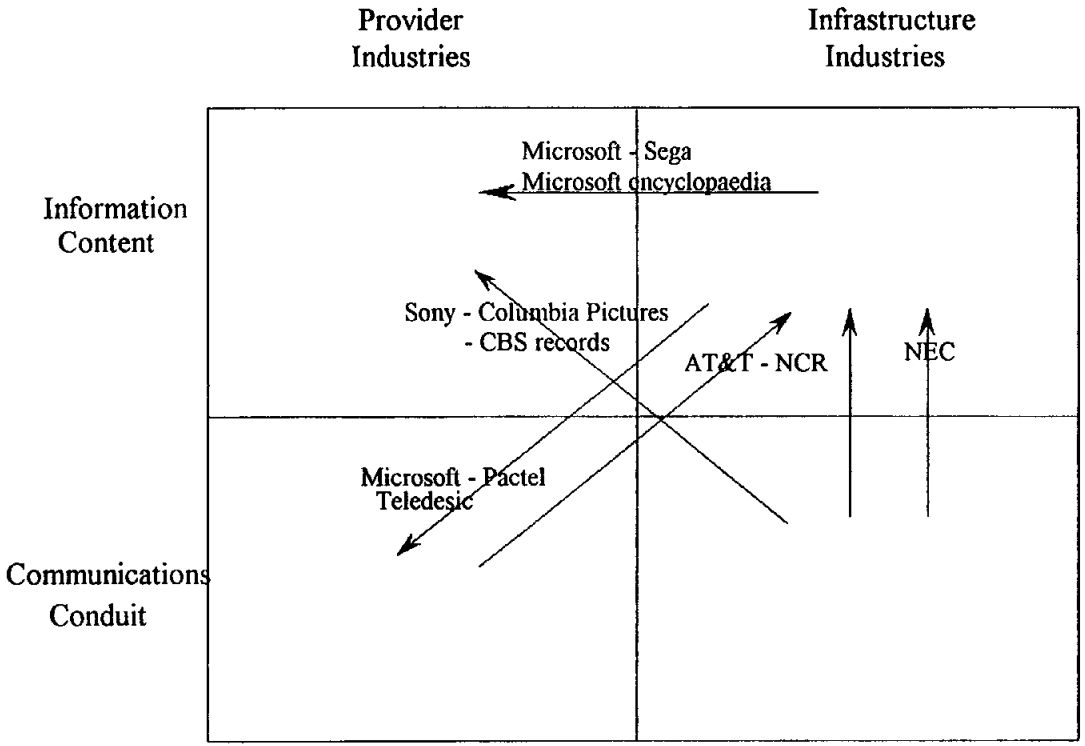

Figure 5

Information content - adding value through technology

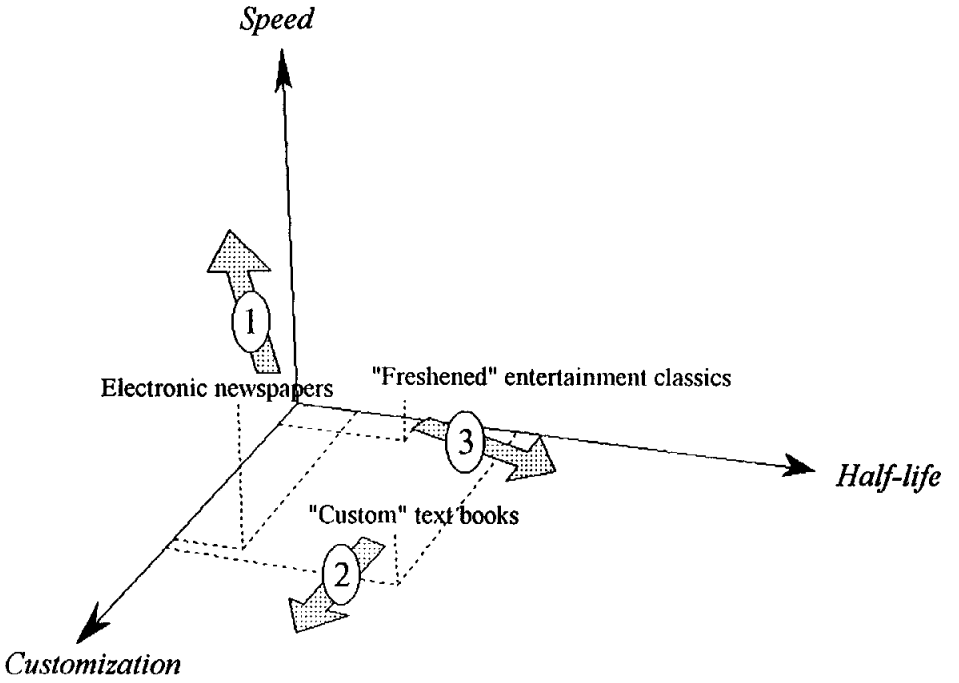

Figure 6

Communications conduit - adding value through technology