
Joint Ventures, Strategic Alliances, and Collaboration in Telecommunications

Jerry A. Hausman

Joint ventures among telecommunications firms have become increasingly common in recent years. These joint ventures have occurred in almost all areas of telecommunications including information services, manufacturing, and mobile service. The firms involved in the collaboration have often been domestic U.S. corporations, such as AT&T and GTE, or international corporations, such as GPT (General Electric Corporation and Plessey) from the United Kingdom and Siemens from West Germany. These joint ventures are a marked change from the situation that prevailed as recently as 1980, when a single firm in each country provided telecommunications services and when one or two large domestic firms manufactured equipment, especially central office and transmission equipment.

Underlying the increasing popularity of joint ventures over the past 10 years are two important changes. The first is the globalization of telecommunications markets; the second is the increasing

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importance of software relative to hardware in telecommunications equipment. These factors interact with the presence of extremely large economies of scale to make most national telecommunications markets too small to support the level of R&D required to develop new equipment.

Unfortunately, the U.S. regulatory framework for telecommunications is especially unsuited to these new realities. Difficult problems of cost allocation between the regulated and competitive segments of a telecommunications company's business have led to protracted legal debates and the expenditure of millions of dollars on legal fees. The 1982 AT&T consent decree, the Modification of Final Judgment, has created additional impediments to the formation of joint ventures among U.S. telecommunications firms. The fact that telecommunications firms not subject to the AT&T consent decree have become involved in numerous joint ventures seems to indicate that the decree has limited the extent to which U.S. telecommunications activity is efficiently organized.

Speculation about the future suggests that international joint ventures will become increasingly common. A vehement debate is currently ongoing in the United States about the appropriate response

of our regulators. Will relaxing the regulatory restrictions on the Bell operating companies reverse the perceived decline in U.S. competitiveness in telecommunications equipment or will it lead to their making greater foreign purchases? I consider

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regulatory initiatives that should decrease the constraints on joint ventures and allow more integrated operations by firms providing voice and information services as well as those involved in manufacturing, especially at the design and development stage of operations.

Joint Ventures: Central Office Switches

We can consider the globalization of telecommunications markets and the increasing importance of software relative to hardware by examining briefly the market for central office switches. Central office switches are the main computers that run local telecommunications networks. Until the 1960s these switches were electromechanical devices. In 1965 AT&T introduced the first large stored program control switch. These switches represented a significant improvement over their predecessors because computers facilitate modernization as new software is released and allow greater flexibility in use. Central office switches now use general purpose computers as control devices with software development acting as the main feature of the networks. In 1976 digital switches were introduced.

Introducing storage program controlled switches changed the balance of switch development from a hardware- to a software-based project. R&D for a modern digital switch is a very lengthy process with extremely high fixed costs associated with developing software. Software accounts for about 75% of the \$1 billion to \$1.5 billion cost of developing a digital central office switch.

These high development costs have transformed international central office switch markets by creating large economies of scale. As a result,

Hausman and Kohlberg concluded that no European country is large enough to support the development of modern digital central office switches. Sales of 25 million to 100 million lines are necessary to recover R&D costs of a digital central office switch. Switch manufacturers have thus concluded that they must compete in international markets to survive. Of course, designing products for international markets increases development costs because of the different network configurations found in different nations, but the "country champion" approach, in which each nation had its own central office switch manufacturer, is no longer viable. Significant exit has occurred from international and U.S. central office switch markets, and unless rapid growth occurs in Eastern Europe or Asia, further consolidation will occur.

These economic considerations will be even more important in developing the next generation of central office switches—either optical switches designed to respond to the increased use of fiber optics or digital switches designed to handle broadband transmissions. The R&D costs associated with the next generation of central office switches are likely to be at least \$2 billion per switch.

These changing economic factors have led to several joint ventures in developing central office switches over the past few years. Table 1 lists some of these recent joint ventures.

Table 1: Recent Joint Ventures in Central Office Switches

Companies	Country	Year
CGE (Alcatel) and ITT	France	1987
Ericsson and CGT	France	1987
AT&T and Philips	Netherlands	1986
AT&T and Italtel	Italy	1989
AT&T and GTE	United States	1989
Siemens and EC-Plessy (GPT)	United Kingdom	1989

In each case the second partner would probably have discontinued its independent development of central office switches. Hausman and Kohlberg estimated that, as a result of the increase in joint ventures, three to five models of central office switches will be developed for the next generation compared with approximately twelve models of central office switches in the current generation. The increasing importance of joint ventures and the large R&D costs they reflect may well cause consortia of

countries to engage in industrial policies to fund future R&D. It is unclear whether markets will continue to become increasingly competitive or whether national governments will require their telephone network operators to buy equipment from joint ventures in which a domestic company is a participant. The "national champion" approach that lasted until the 1980s could evolve into a "European champion" approach after 1992. The threat of a Fortress Europe policy in telecommunications equipment procurement, with the resulting reduction in competition, would lead to higher prices and lower quality services for European consumers of telecommunications services. Fortunately, most of Europe currently seems intent on promoting greater competition.

Increasing Importance of Joint Ventures in Telecommunications

These considerations apply not only to central office switches, but to many other areas of telecommunications. In the computer industry "open network systems" are often discussed as a way to increase the portability of programs and to decrease the importance of proprietary software. Such a development is quite unlikely in telecommunications, however, because telecommunications software must be extraordinarily reliable. To date all telecommunications software systems are entirely closed and proprietary. Thus, joint ventures are increasingly attractive as telecommunications evolves into a software-based industry.

Technology transfer has also played a role in increasing the importance of joint ventures in telecommunications. It is extremely expensive to develop all of the necessary expertise to carry out certain development projects. For example, a computer company may lack needed expertise in many areas of telecommunications that can be easily provided by a telecommunications company. An example of such a cooperative arrangement is the recent joint venture announced between Schlumberger, an oil field services and electronics company, and NTT, the main Japanese telephone services provider, to develop, build, and market integrated circuit devices. Each company brings existing knowledge to the 50-50 project that would be quite expensive for either partner independently.

The three recently announced consortia for developing personal communications networks in the United Kingdom also demonstrate the importance of technology transfer. These networks are likely to

be the next generation of cellular telephones. They are designed to give people telephone "tails" based on an intelligent network design so that an individual will have a single telephone number with which he can be reached anywhere in the country. The exact form of personal communications network technology is still unknown. The technology will require significant development expenditures. The estimated investment for each of the three networks is expected to be in the \$1 billion to \$2 billion range.

Table 2 lists the members of each of the three personal communications network consortia. Note

Table 2: Personal Communications Network Consortia Members in the United Kingdom

Group 1	Group 2	Group 3
BAe (U.K.)	Cable and Wire-	STC (U.K.)
Pacific Telesis	less (U.K.)	Thorn-EMI (U.K.)
(U.S.)	Motorola (U.S.)	US WEST (U.S.)
Matra (France)	Telefonica (Spain)	Deutsche
Millecom		Bundespost
(U.K. & U.S.)		(Germany)
Sony (Japan)		

that a British corporation is a member of each consortium, but there are equipment manufacturers from Japan, France, and the United States and telecommunications and cellular telephone service providers from Germany, Spain, and the United States. The expertise of the Bell operating companies in operating large cellular telephone networks will

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be combined with the radio and equipment expertise of the other consortia members. It is striking to compare these multinational consortia with the situation 10 years ago when only host country firms would have been involved. Furthermore, the expertise gained in the United Kingdom is likely to be

transferred to other countries where personal communications networks will be developed in the near future.

Finally, new challenges in the area of distribution and marketing have also contributed to the attraction of joint ventures. Markets are becoming increasingly worldwide in scope so that local distribution systems are very important. For example, General Electric and Ericsson recently entered a joint venture to manufacture cellular telephone and mobile radio systems for the U.S. and Canadian markets.

In evaluating alternative types of corporate arrangements for R&D, the level of risk often becomes the overriding consideration. Joint ventures that foster the pooling of risks and straightforward division of costs and profits seem well suited for such situations.

General Electric's initial attempt to manufacture and distribute cellular telephones was unsuccessful, but General Electric has a well-developed distribution system in the United States. To date, Ericsson has had moderate success with its cellular central office switches in the United States but has not played a major part in providing cellular equipment to users. Thus, each partner brings important skills to the joint venture.

Despite their growing importance in telecommunications, joint ventures are often criticized as an ineffective form of corporate organization. Joint ventures are often viewed as difficult to manage, and the strategic alliances so formed are often unstable. Thus, it is natural to ask whether other corporate forms will compete with or even supplant joint ventures in telecommunications.

Vertical integration might provide an alternative to joint ventures, for example. Of course, to a certain extent, vertical integration was explicitly rejected in the decision to force the divestiture of the Bell System. Thus, regulators are unlikely to permit widespread vertical integration because of the difficulty of regulating a vertically integrated company and the perceived gains from competition in both telecommunications equipment and services. Furthermore, as the increasing globalization of telecommunications markets has indicated, no single country, with the possible exceptions of the United States or a consolidated Europe, has a large enough

market to allow a company operating only domestically to achieve an efficient size. Thus, vertical integration is unlikely to represent a viable alternative to joint ventures.

In principle, of course, a telecommunications service provider could simply contract with an equipment manufacturer to design and develop equipment and software to provide new telecommunications services. It is difficult, however, to achieve the correct economic incentives for either contracting party, especially when the technology is very dynamic and uncertain. Typical R&D projects have many misses and only a few successes. A common rule of thumb is that only one in ten projects succeeds. The successes must therefore return high profits to cover total R&D costs and to stimulate investment in innovation. Contracts, unfortunately, sometimes allow for opportunistic behavior in which one company can attempt to extract the profits from a successful project; for example, a required software update can be made very expensive. Cost-sharing arrangements agreed to before joint ventures are begun are less subject to abuse. In addition, follow-up projects can be undertaken in a joint venture without subsequent contractual renegotiations or the specification of which company has property rights to valuable knowledge produced in the original project.

More generally, in evaluating alternative types of corporate arrangements for R&D activity, the level of risk often becomes an overriding consideration. Joint ventures that foster the pooling of risks and straightforward division of costs and profits seem well suited for such situations, despite their disadvantages.

Structure of the U.S. Telecommunications Industry for Joint Ventures

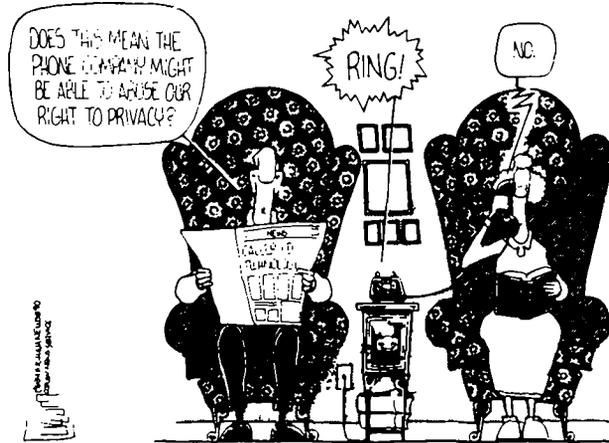
The 1984 breakup of the Bell System separated long distance and local telecommunications services in the United States. AT&T did, however, retain Western Electric and remained the largest provider of both long distance service and telecommunications equipment in the world. Currently, AT&T, MCI, and US Sprint provide most of the long distance service in the United States. The seven regional Bell operating companies provide 80 percent of the local service. GTE, United Telecom, and two smaller independent companies, Southern New England Telephone Company (SNET) and Cincinnati Bell, also provide local service. The seven regional companies are subject to the Modification of Final

Judgment, while GTE, United Telecom, SNET, and Cincinnati Bell are not. The consent decree forbids the regional Bell operating companies from engaging in manufacturing or providing long distance service and limits their provision of information service. In particular, under a 1987 decision by Harold H. Greene, the U.S. District Court judge who oversees compliance with the consent decree, the operating companies are not allowed to engage in design and development and are prohibited from manufacturing equipment. While the Bell operating companies may participate in international joint ventures outside the United States, they cannot use the knowledge gained in international ventures domestically or import equipment or software they develop abroad into the United States.

In the U.S. telecommunications industry GTE, United Telecom, SNET, and Cincinnati Bell engage in joint ventures in long distance, equipment manufacturing, and information services (or value-added networks). For example, GTE and United Telecom jointly own US Sprint, a leading long distance company. These partners also operate Telenet, a leading value-added network. GTE and AT&T have a joint venture to produce central office switches, and GTE has a joint venture with Fujitsu and with Siemens in the international telecommunications equipment markets. SNET is a partner in Lightnet, a provider of long distance fiber optic network bulk service. SNET also has a strategic relationship with Tymnet, another leading value-added network. Finally, Cincinnati Bell develops software and firmware jointly with NEC, a leading Japanese manufacturer, and provides several information services jointly with other companies.

These business relationships and the considerable value of the Bell operating companies as partners in international joint ventures to develop personal communications networks suggest that the Modification of Final Judgment, in prohibiting the Bell operating companies from participating in domestic joint ventures, is hindering an efficient form of economic organization in international and domestic telecommunications markets.

The restrictions under which the Bell operating companies operate are the subject of vehement policy debate. The NTIA and the FCC, the two executive branch agencies charged with overseeing and regulating telecommunications in the United States, have both called for a change in the law to permit Bell operating companies to participate in information service and manufacturing activities. In 1987 the Department of Justice, a signatory of



the consent decree, also called for removal of the restrictions. Judge Greene, however, has refused to relax the restrictions that remain.

AT&T, the other signatory of the consent decree, has not opposed removal of the restriction on information services, but opposes relaxing the restrictions on manufacturing activities. Numerous other information service providers and manufacturers also oppose relaxing the restrictions because they claim that the Bell operating companies would engage in anticompetitive monopolization of markets they are allowed to enter.

Interestingly, a number of the operating companies' competitors, formerly opposed to relaxing the consent decree's restrictions, have now called for their removal. Northern Telecom, for example, has urged that the operating companies be allowed to participate in the manufacturing process so that they can bring their expertise to the information

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industry. Northern Telecom also maintains that the industry would grow faster if the restrictions were removed. Similarly, Digital Equipment (DEC) and Hewlett-Packard, the two largest manufacturers of minicomputers apart from IBM, have called for removal of the restrictions. DEC has several joint ventures with other U.S. telephone companies and

has expressed an interest in exploring similar collaborative efforts with the Bell operating companies.

Finally, Congress is considering legislation that would remove the restrictions on joint ventures in information services and manufacturing while placing safeguards on possible anticompetitive activities. Considerable public debate has taken place over whether the U.S. telecommunications trade balance, which changed from a large surplus before the Bell System divestiture to a large deficit today, would be favorably affected by the Bell operating companies' participating in manufactur-

Two problems arise from the restrictions in the Modification of Final Judgment: there are fewer new telecommunications products and services available in the United States than there would be otherwise, and U.S. competitiveness abroad has decreased.

ing joint ventures. Also, critics of the restrictions point to the success of information services in foreign countries such as France, compared with the limited nonbusiness use of information services in the United States.

More heat than light has probably been created by these debates, and all parties are guilty of selectively using data to prove their points. The continued political activity of various special-interest groups has been able to stop similar legislation in the past, and there is no guarantee that Congress will act in the near future.

Possible Regulatory Solutions in the United States

Two problems arise from the restrictions in the Modification of Final Judgment: there are fewer new telecommunications products and services available in the United States than there would be otherwise, and U.S. competitiveness abroad has decreased. The first problem arises because the largest providers of local telephone service in the United States cannot participate in the development of new products or services except at the most basic level. The companies with the best knowledge of their customers' needs cannot participate in designing the new products and services. This situation is very different from that in Japan, Great Britain, France, Sweden, Germany, and many other

nations where the provider of local telephone service is heavily involved in the design and research and development of new products and services even when it is not involved in the actual fabrication of the equipment.

The problem relating to international competitiveness arises because a Bell operating company cannot use any technology it developed in an international venture in the United States. Although Motorola will be able to use the technology it develops in its personal communications networks joint venture in the United Kingdom in domestic products, neither Pacific Telesis nor US WEST will be able to use the technology in the United States because of the consent decree. Since the United States is the largest country in terms of telecommunications demand, the inability of a joint venture participant to earn any return in the United States from its technological investment decreases the economic incentives for investment abroad. Thus, U.S. companies that are restricted by the Modification of Final Judgment are less competitive abroad, although the consent decree places no explicit restrictions on their international activities.

In the absence of congressional action, there are two possible ways to address these problems. The first lies with Judge Greene. Greene believes that participation by the Bell operating companies in domestic joint ventures could lead to cross subsidies that would cause higher phone rates for local subscribers and could lead to an anticompetitive advantage for the Bell companies in equipment and information service markets. In April 1990 the Court of Appeals, which reviews Judge Greene's decisions, reversed and remanded his recent decision with respect to information services. The Court of Appeals pointed out that the question of local rates is for state and federal regulatory bodies to decide and is outside Greene's jurisdiction. Furthermore, the Court of Appeals stated that it is very unlikely that the Bell operating companies could engage in anticompetitive activities in information services and most types of equipment markets. Thus, the Court of Appeals seems to favor the Bell operating companies' participation in information services and equipment markets. Judge Greene will be required to reconsider these issues, and the Court of Appeals could review his next decision as well. Given the changed principles put forward by the Appeals Court decision, however, Judge Greene could change his decision on the operating companies' participation.

The system of rate regulation in the United States offers another avenue for change. Rate regulation

of telecommunications has always used a cost-based, rate-of-return formula. Under rate-of-return regulation, prices are based on total variable costs plus a "fair" rate of return on capital. Possible problems arise under this regulation when a firm also engages in competitive activities, such as joint ventures. A regulated company has the incentive to claim that part of the cost of the joint venture is caused by the regulated phone service it provides. If the regulator can be convinced, the price charged to captive ratepayers will increase as the costs included in the rate base have increased. Such cost-shifting will increase profits from the unregulated competitive service. Concern about such behavior was one of the major reasons for the breakup of the Bell System, and it underlies the frequently noted anxieties about cross subsidization.

A different form of rate regulation could remove these perverse economic incentives, however. Price-cap regulation was first applied to telecommunications in the United Kingdom in 1985. Price-cap regulation was actually developed to address the lack of any economic incentive for efficient, least-cost provision of noncompetitive services. Since rate-of-return regulation sets prices based strictly on costs, regulated firms do not gain from adopting cost-saving innovations. Such efficiencies simply lower prices. Price-cap regulation is not based on the costs of the individual companies. Instead, price caps are adjusted each year on the basis of changes in inflation and a productivity index that calculates the difference in productivity change between the telecommunications sector and the rest of the economy. Thus, a telecommunications company that does better than average in terms of productivity improvements will enjoy increased profits that the regulators will not take away.

Since price-cap regulation is not cost-based, it also eliminates the incentive to shift costs from unregulated joint ventures to regulated services. Similarly, very difficult questions of cost allocation no longer arise because prices are not based strictly on company costs. Thus, introducing price-cap regulation could remove the major impediments to permitting the Bell operating companies to participate in joint ventures in information services and manufacturing.

It currently appears that price-cap regulation may largely replace rate-of-return regulation in the United States. The FCC adopted price-cap regulation for AT&T in 1989, and clearly it intends to adopt price-cap regulation for the Bell operating companies unless Congress intervenes, which appears to be

unlikely. The FCC, however, regulates only one-third of local telephone companies; the other two-thirds are regulated by the states. Among state regulatory bodies opinions differ widely on the advisability of replacing rate-of-return regulation with price caps. In 1989, however, California, one of the most progressive states in regulatory policies, adopted price-cap regulation. A number of other states have also adopted either price caps or regulatory frameworks similar to price caps. Once price caps are more widely adopted, it will become increasingly difficult for Judge Greene to restrict Bell operating companies' participation in joint ventures because the cross-subsidy theory on which he has based his refusal to permit such participation will be eliminated or at least greatly reduced.

Conclusion

Joint ventures are not an ideal form of corporate organization, but a better organizational form is currently unknown for cases where two or more companies bring specialized areas of expertise to costly new product and service developmental efforts. I expect the number of joint ventures in telecommunications to increase primarily because of the increasing globalization of markets and the

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large economies of scale in telecommunications R&D. A movement toward "Fortress Europe" and a subsidized European champion could decrease the number of joint ventures, reduce international competition, and make European telecommunications consumers worse off. At least for now, however, Europe seems to favor greater competition.

In the United States the regulatory framework established by the AT&T consent decree has prohibited domestic joint ventures for the Bell operating companies. Although the complaints of predivestiture competitors of AT&T were real, to a large extent

the problems were caused by rate-of-return regulation. Adopting price-cap regulation should remove most of the worries about cross subsidies and allow the Bell operating companies to increase their participation in joint ventures. Market experience in Europe and in the United States has demonstrated that the constraints imposed by the Modification of Final Judgment affect the efficient organization of telecommunications in the United States. Regulatory changes brought about by either the courts or Congress are needed to bring U.S. regulation more in line with regulation of telecommunications corporations in Europe and Japan.

Selected Readings

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