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Public and Private Cooperation in International Informatics

PETER F. COWHEY

The melding of communications and information technologies forms the core of the world's electronics and advanced services sectors. Producers and service providers utilizing these merged technologies are commonly collectively called the informatics industries. Informatics faces the market traditions of its precursor components, and these traditions are incompatibly different. Thus, domestic communications markets have been routinely closed to foreign competition—particularly in services, but also even in goods. At the same time, significant, although far from complete, openness in information (computing) has been allowed. This means more firms have been able to trade internationally and invest freely in other countries (and their own) in computing than has been the case in communications.

More broadly, in part because historically they have been otherwise more easily tradeable (transportable), there has been more openness to trade in goods than in services. Services have surpassed goods as a share of national product and new job creation in advanced economies, and competitive advantages in goods and services are becoming more mutually dependent. There has thus been a fundamental change in the nature of the environment in which existing trade and regulatory relations were created. In a sense, therefore, informatics becomes a microcosm of the broad issues of international economic relations: Conflicting traditions have to be reconciled or superseded.

This chapter addresses the question of what sort of regime will prevail for informatics. The answers lie in the interaction of corporate strategies and government choices about the openness of markets.

The regime for a market is created by governments and by firms. Government rules, principles, and decision-making methods are obviously a major part of the environment in which the world economy works. Governments set the rules for competition, but they carefully observe what their firms want. Firms in turn calculate the economic and political parameters of the market and launch new strategies based on their assessments. These corporate strategies alter the

nature of international interdependence. The resulting regime is a product of both the public rules of governments and the private governance of firms. All this is true at both the domestic and international level. The concern here is with the international market and environment.

A country can have a fairly competitive domestic market but, directly or through “structural impediments,” restrict competition by foreigners in terms of trade (barriers to imports) or investment. Japan usually surfaces as an example. What I have termed “openness” (which is closely related to what is talked about as contestability or market access) is the basic factor in this chapter with regard to government impact on market environment. Market access is more important than any individual principle of free trade in the minds of some U.S. trade negotiators (Cowhey and Aronson 1992; *GATT Focus* 1991 Nov/Dec, p. 2).

Regimes can also change even if the degree of formal openness remains the same—the changes arise from the internationalization of firms. The degree to which dominant firms internationalize their business to become global firms is thus the second basic factor analyzed for its effect on market environment.

The question facing governments and corporations is: Where is the informatics sector heading? The answer depends on the extent to which internationalization and the degree of openness of the regime are changing. This chapter argues that there is a profound shift in both dimensions. During the 1980s the action is shifted away from a restrictive international regime. A traditional free-trade regime grew (and will grow) in importance because it is the simplest solution. Many of the important innovations in the 1990s, however, will occur in what I call “market access regimes” and “internationalization of regulation regimes.” The concluding sections of this chapter show how.

To lay the groundwork for this, the next section outlines the determinants of change in the two basic factors—contestability and firm internationalization—and looks at the international regime for communications before 1970. The second section looks at the regime we are coming from, while the third examines evidence concerning economic and political change in the environment. A minimal-change scenario is developed in the fourth section. The last section reviews evidence that a more dramatic change is occurring in the environment for global informatics.

3.1 The Determinants of Change

Domestic politics set the initial agenda for what states seek from international regimes and interact with considerations about the distribution of international power and transaction costs to determine how open states will allow their markets to be. Countries seek regimes that reinforce domestic political bargains concerning markets—bargains reflecting domestic political demands that already incorporate expectations about international factors. In other words, firms have expectations about the international competitive and political environ-

ment, and they factor these into their claims with regard to both domestic and foreign economic policies. The same is true of government agencies.

Three broad changes in the global economy have been shifting the political preferences of many countries regarding the informatics sector. First, the firms involved are becoming more international as measured by the percentage of their total sales in other countries. This has created support among firms and their work forces for international openness. AT&T and British Telecom plan to have over 50 percent and 25 percent, respectively, of their revenues from international markets by the year 2000. As recently as 1983 neither had over 10 percent. This mirrors a general shift (Millner 1988).

Second, users of communications systems are becoming more sensitive to supply and pricing. This has boosted political support for competition. Third, many key users are global firms and government agencies that want both domestic and international reforms. (Regimes are never a simple extension of the preferences of particular industries and their government overseers because they also influence the welfare of other voters, industries, and government agencies.)

At the same time, many informatics technologies now have features such as high fixed costs or specialized and competing technical standards, which add the risk of oligopolistic strategies that negate some of the advantages of relying on free trade and openness (Krugman 1986). In short, there is pressure for more openness at the domestic and international levels, but also suspicion that classic free trade alone is not enough.

3.1.1 Transaction Costs

The current mix of incentives makes transaction costs—the costs of information, bargaining, monitoring, and enforcement in coordinating action in any group—a particularly important factor in determining the form of openness to pursue. Higher transaction costs make it easier for countries to renege on international bargains. (Economists describe this as “opportunistic behavior”; see, for example, Williamson 1985.) The creation of industrial policies to bolster international competitive positions is one example.

One purpose of international regimes is to reduce transaction costs. Successful international regimes often have inertia because there are transaction costs to governments if they change the regime significantly.

Transaction costs are also tied to power because the greater the concentration of international power, the easier the establishment of an open international regime. Open regimes are fragile because they require closer adherence to non-discrimination than do closed regimes. They also impose concentrated short-term costs on many political constituents in return for diffuse long-term gains in efficiency. A clearly dominant power has a sufficiently large stake in the international system as a whole to offer rewards and apply pressures to get other countries to agree to an open world economy.

A dominant power can assist an open regime, but how can other nations guarantee the leading power will act in good faith, especially because powerful

countries with less dependence on trade have to cope with the problem that there is always a constituency for protectionism. (In comparison, small states with greater dependence on trade usually create political institutions to restrain interests opposed to openness; Rogowski 1987). One way is for other countries to give the great power's domestic interest groups special incentives to support the international agreements, and this is often done. Thus, many features of the current international regime may now have to change to fit the idiosyncracies of the domestic Japanese political economy because of its importance in the global order.

As hegemony declines, a small club of countries can serve as the focal point for liberalization. However, member nations will emphasize careful monitoring of agreements and more elaborate systems of side payments among themselves (Yarbrough and Yarbrough 1987). The diffusion of power leads to a greater emphasis on minilateralism as a supplement to more universal international arrangements. *Minilateralism*, as the term implies, is narrower than *multilateralism*. That is, it is generally focused, ad hoc if you will, in the sense that it relies on selective, perhaps overlapping, groupings of like-minded countries to organize international bargaining rather than relying on more inclusive bargaining forums.

In the case of informatics, U.S. power was sufficient to break the old regime of closed markets and minimally internationalized firms. However, the emerging regime bears the stamp of growing minilateralism and careful safeguarding against opportunistic behavior.

3.1.2 Before 1970

World communications operated in an essentially restrictive international regime before 1970. Major global commercial strategies reflected relatively low degrees of internationalization. Moreover, the only major example of internationalization involved an essentially closed market; Intelsat was a single global organization created to provide a jointly owned global monopoly on satellite service. Let us examine the individual components.

International services were jointly provided in closed markets with complementary needs. The ITU provided the framework. It held that all international services were a bilateral monopoly characterized by joint investment from PTTs. However, because the United States was a major player, the ITU accepted private ownership of U.S. international communications carriers, which made it easier for them to operate outside the United States.

In theory each country supplied its half of an international circuit and exchanged traffic at midpoint. All revenues were split equally, based on a negotiated accounting rate, regardless of the country originating the telephone call or telex. Customers usually paid much more than the accounting rate because each monopolist was free to charge what it wished for traffic originating in its home market. This approach assumed national monopolies had complementary needs in sharing their monopolies. Markets were closed, but international exchanges were harmonious mutual accommodations among national monopolies.

Telecom services and companies were essentially domestically oriented, and governments vigorously attempted to structure competition within the domestic market (Cowhey 1990).

The ITU system was somewhat less restrictive for equipment than it was for services. Most equipment markets were controlled by national telephone companies. European countries and Japan actively kept national production in local hands as much as possible, and AT&T owned its own equipment manufacturer. Firms with desirable technology often accepted licensing as a way of increasing returns on their research. Technology licensing and consulting thus reflected complementary needs, and government policies in this area tacitly supported largely closed international markets.

Only after the United States began to open its own market unilaterally did tension arise over the communications equipment market. Protection at home combined with ambitions to sell abroad—mostly to the United States and some developing countries—helped create in several countries consortia of domestic firms that aimed to develop collective capabilities. It should be stressed that these export-oriented alliances rested in part on a refusal to allow foreign firms access to the home market. This was the classic strategy of Japan. In contrast, there was vigorous and fairly free trade in computers in large parts of the world market, even though Japan and other countries actively promoted local producers.

3.2 The Regime from Where We Come

The market for communications equipment is either network or customer premises. Network equipment, about two-thirds of the total, includes items such as central office switches and fiber optic cables; customer-premises equipment (CPE) covers private branch exchanges (PBX), telephone key systems, facsimiles, handsets, and the like. The total market for services far surpasses the market for equipment. Each of these three elements of the current regime are discussed in this section.

3.2.1 Network Equipment

Network equipment is fairly concentrated, with each country traditionally having had one to three market leaders and a public monopoly buyer. In the pre-divestiture United States, the service revenue of AT&T was bigger than any Post, Telephone, and Telegraph (PTT). In addition, unlike PTTs, AT&T had its own manufacturing arm. The economies of scale, in particular for switches and satellites, are further narrowing the market; however, fiberoptics and satellites would be only modestly internationalized except for the fact the customer base is strongly clustered among a handful of public authorities.

Central office switches in the 1990s will cost \$2–3 billion to develop; the previous generation cost from \$0.5–1 billion. Most analysts believe three or four independent technology platforms will exist, and all remaining switch makers

will cluster around them (much as many makers of mainframe computers basically use one of the seven principal architectures available from the leading companies).

The market for switches is becoming more diverse because private users are now also buying them, but it is still highly concentrated and requires constant interactive support for software development. These conditions suggest that internationalization of the technology will be high even though market leaders are usually reluctant to enter corporate alliances. (This analysis omits the possibility that smaller switches may play a role like that of minicomputers. Minicomputers did not eliminate mainframes, but they changed the market.)

3.2.2 Customer Premises Equipment

The CPE market has several niches, which contributes to its high fragmentation. Technological capabilities are disseminated rapidly and economies of scale for individual products vary radically—for example, they are high for key telephone sets and low for data transmission devices. Market leaders are tapping economies of scope across a family of products, including some kinds of network equipment. This broadening is often done by buying out other companies in their own countries. For example, computer makers purchased producers of T1 switches and specialized communications technologies.

Although it is something of an oversimplification, into the early 1990s certain skills have been geographically concentrated. U.S. makers excelled at network management CPE that allows individual users of networks to manage or duplicate many central network functions. They also had the most sophisticated links between computers and communications. Although Japanese firms originally focused on lower-end technology, they moved in the late 1980s to CPE featuring specialized semiconductors that add value to network inputs, a move similar to what they did with television and fax equipment. European firms specialized in equipment that efficiently interconnects with network services. These differences reflected divergences in expectations regarding evolution of networks.

From the late 1970s consultants and companies were predicting and developing products for a CPE market intermeshed with the computer market, only to be largely disappointed in the success of their offerings. At last, as the 1980s ended, intermeshing had really begun to happen. There are predictions that integrated business systems—packages combining a digital PBX, LAN, and WAN—will capture a majority of the combined network and CPE market by the mid-1990s (e.g., Roobeek 1988).

There was a consolidation of major suppliers of central network equipment and mainframe computers in several countries in the late 1980s, such as the creation of GEC Plessey Telecom (GPT) and Ericsson's buy out of its British partner (Thorn) in Great Britain and the Alcatel purchase of ITT operations for \$1.3 billion in France. Siemens purchased GTE's non-U.S. switch and domestic transmission businesses and entered a joint venture with GPT in the United

Kingdom—a move matched by Northern Telecom's joint venture with Britain's STL.

There has also been horizontal expansion for firms already in either computer or CPE markets. Hewlett Packard launched its own X.25 packet switched network products and bought a minority share in a U.S. electronic mail and voice processing firm (Octel), intending to market these services globally. Unisys bought Timeplex (a T1 vendor), IBM deepened its ties with Network Equipment Technologies, and Tandem Computers bought a leader in LANs to build better bridges between local and wide area networks.

Demand for particular classes of products is highly unstable because their capabilities overlap with other product lines, leading to battles over which approach should dominate. Moreover, the cutting edge of the customer base is still relatively concentrated among large global users who demand interactive customization of technology and interconnectivity among all of their equipment suppliers. Interconnectivity and customization make simple standardization hard. The result is hybrid forms through common alliances among firms promoting technological infrastructures (such as a particular architecture) and product networks (such as sharing technology to allow compatibility across production lines of participating companies).

3.2.3 Services

Services are becoming difficult to categorize. This is not just because modems and facsimile machines are routinely attached to "voice" (standard telephone) circuits. Value added networks (VANs) and information services are also called *enhanced services*. The older value added services include protocol conversion, packet switching, and remote computer services. This is where the meshing of computers and communications is most palpable—in application-specific integrated circuits (ASICs) and software that controls the electronics that make many services both needed and possible.

Traditional service markets will not prove as contestable as equipment markets. Nearly half of all service markets are local telephone services, which may never be opened to foreign firms, or opened by allowing partnerships of foreign and domestic firms to buy privatized national telephone companies. Politics and technology; however, have made competition in a number of areas more likely. These are international voice, data transmission (ranging from dedicated leased circuits to value added services), information and computer services, and cellular telephone franchises.

The underlying architecture and degree of competition in the public communications network strongly influence the feasibility and competitive advantage of different types of information services and computer equipment. Indeed, hardware- and software-defined services are often exchangeable within a network. Thus, Centrex and the PBX are rivals; however, services and equipment can also be complements. Huber (1987, p. 13-3) noted that the \$900 million per year market in the United States for alarm monitoring was made

possible by additional services and equipment for the monitored premise, at a cost of over \$2 billion per year.

3.2.4 Data Transmission

The physical infrastructure of a network is a specialized asset with a limited range of uses. Once installed, there are strong incentives to exploit its limited range. Competition among new international facilities for traffic opens the prospect of highly volatile behaviors ranging from predatory pricing to dropping regulatory restraints on the use of facilities to lure customers. It may also lead to innovations in relationships between users and producers seeking to assure traffic loads. Many countries are permitting selective competition in specialized infrastructure facilities, such as mobile satellite systems and cellular phones. Companies are therefore bidding for franchises in a number of different countries with an eye to building interconnected global networks.

Consistent, current estimates of the world data communications market are difficult to come by. The 1987 market was estimated at \$223 billion, 22 percent services and 78 percent products, with just under half of each in North America (Aronson and Cowhey 1988, p. 66). This excludes all voice services, although some of these will become subject to competition (particularly those for private corporate networks). While international voice services are the most profitable segment of the market, data-related services are seen as having more growth and profit potential. Hence the computing and information side of this market, including equipment and services, is the heart of most company strategies. It also represents the market segment where the political pressures for change in countries outside the United States are greatest.

3.3 The Regime in Transition

Demands from suppliers and users for openness and competition, problems with transaction costs due to the nature of the technologies, and moderate diffusion of global power combine to lead one to expect innovation in global regimes.

Historically, competitive assets often have been concentrated in one country early in a product cycle. For example, U.S. software firms and Japanese manufacturing firms may have carved out some unique advantages by the late 1970s (Mowery 1988, pp. 1–22). Neither of these edges will be as true in the 1990s as they once were. Openness encourages international diffusion of competitive capabilities, and that promotes internationalization of complementary assets. As research, manufacturing, and marketing (“key competitive assets”) become less concentrated in a single country, companies will rely more on international operations to secure complementary assets.

Costs for research are rising while product cycles are shortening. Firms are responding in a variety of ways. They are entering alliances to share R&D costs. They are emphasizing quick global positioning of products to capture the

margins necessary to recover those costs. They are seeking to enhance economies of scale and scope in manufacturing by combining global export platforms and local plants to customize products to national market niches and deploy them quickly (Thomas 1988).

3.3.1 The Politics of Openness

In the first thirty to forty years after World War II, under U.S. leadership, the world moved toward greater openness, but this was not in informatics. The reason was domestic politics.

The world today is more fragmented because the United States has become less of a hegemonic international power. However, there are now many players besides the United States who see the benefits of openness, and they wield enough market and political power to make further liberalization conceivable so long as they work together in arrangements emphasizing more careful checks and balances concerning their conduct. One symptom of the rise of unilateralism and elaborate safeguards to monitor burden sharing. U.S. bilateral trade agreements with Canada and Israel are good examples, as are the aggressive reciprocity provisions in the 1988 U.S. trade law.

Transaction costs in international bargaining depend significantly on technology and the way international institutions cope with costs. The most important characteristic of informatics is the difficulty of monitoring good faith agreements for services. For example, what constitutes a fair cost for a leased circuit?

Another problem is assuring interconnectivity of all communications facilities, services, network equipment, and CPE. For example, CPE and enhanced services suppliers benefit from a deeper knowledge of the technology and pricing of the basic services network. This poses transactions cost problems among the different segments supplying the informatics network. (The problem is analogous to the worries IBM's rivals used to have about their knowledge of the system's network architecture when IBM's dominance of the mainframe computer market mattered.)

When is the design of a public network discriminatory against foreign competitors? These issues are very difficult to resolve domestically, and even more so at the international level. The old regime for informatics solved these problems by simply providing a few common standards among divergent systems of national standards. Joint monopoly for international services removed temptations to cheat in services because each side could only deliver its monopoly service with the help of the other. The new technologies require more common designs for national networks, and politics now require curbs on monopoly solutions. Finding institutional solutions for monitoring and enforcement is very difficult and may drive companies to novel forms of global integration and alliances with other firms to overcome the problem. These experiments are especially important when it comes to the creating of new international communications carriers, as discussed later.

3.3.2 *The Impact of Technology*

Neither international power nor bargaining issues would matter if a revolution had not occurred in the interest group politics of informatics. Most countries long ago granted authority over communications to a single monopolist and then merged the telephone company and the government ministry that regulated it. In addition, countries often mixed their postal and telephone services under one operation, which became known as the PTT. As a rule, long-distance services subsidized both local telephone and postal services. In addition, the telco subsidized local equipment makers and their workers. Telcos generally did not own equipment makers, the U.S. and Canada being exceptions.

Regulatory reform in telecommunications always invokes issues concerning those who benefits from change. Many important technological breakthroughs in information use have been clustered among the relatively few corporations and government agencies that are the largest users. Typically, 5 percent of all users constitute over half of long-distance traffic (Saunders 1989). Members of this group have both the motivation and the resources needed to influence communications regulation. They stopped treating communications solely as a domestic issue long ago. They now have active interest groups promoting global regulatory change.

Similarly, the microchip revolution allowed many important new companies to enter the electronics industry, particularly in the US and Japan. Traditionally, a handful of older firms dominated the production of equipment in conjunction with the dominant national phone company. Newcomers wanted to break this cozy relationship because the dominant companies received too many benefits that spilled over to their operations in related markets, giving the established players an "unfair" advantage. Now that the newer firms are succeeding, they are split on how to balance goals of interconnectivity and proprietary technical advantages.

Finally, many service and equipment producers, as well as large users, wanted to produce new information- and telecommunications-based services. There are instances of large users moving into the long-distance and information-network businesses by offering their own networks to others—Westinghouse and Sears in the United States are examples. Electric utilities in both the United States and Japan also have gotten into the telecommunications business.

3.3.3 *Reforming the Monopolies*

Countries vary in how they sort out who wins and loses from reform because every sectoral regime is part of a broader effort by political leaders to cement general electoral or political support. Every country maintains some cross subsidies for households in order to avoid political trouble. There also is concern about how to offer smaller businesses the same services as those available to larger firms. Moreover, every country except the United States still has some form of support for its preferred providers of network equipment.

Still most countries are modernizing their monopolies by no longer treating

the PTT as a cash cow for the government or other stakeholders in the telecommunications system. Profits are being reinvested to modernize services. Reform is also changing policymaking by separating post and telephone services, introducing independent regulatory commissions instead of letting the PTT set policy, and sometimes privatizing PTTs to make financial planning and labor policies less subject to the whims of government policy.

The reform movement is also curtailing the monopoly power of national telcos over the sale of CPE and liberalizing the provision of installation and repair services. This opens the way to independent systems integrators such as Computer Sciences Corp. and Electronic Data Services (EDS), which provide services, software, equipment, and enhanced communications services. Just as strikingly, the major telcos are privatizing their own services to become systems integrators and customers of systems for major customers.

PTTs argued either there were economies of scale in the production of the equipment or that control over the equipment was necessary for maintaining consistent technical standards and high-quality service. As a result, although few countries ever sanctioned a monopoly over supplies, most bought from a handful of national companies or a few national companies plus one foreign firm that was obligated to undertake extensive local production, as in the case of ITT in Europe. The FCC's abortive attempts in 1986–1987 to monitor purchases of foreign equipment by BOCs is a reminder that the United States is not exempt from this practice.

The provision of network equipment is also being modified. The new policy ostensibly liberalizes procurement practices, but only to the extent of permitting a greater array of foreign suppliers to achieve larger minority market shares. There are strong indications that local content requirements will prevail even in industrialized countries. Thus, the EEC proposed that open procurement of network equipment will apply only to firms with 50 percent or more local content after 1992. It would waive the rule if EEC firms have equal access to a foreign supplier's home market.

3.3.4 Openness

Trade negotiators have started to win acceptance of three principles: (1) technical requirements must be transparent to all buyers and sellers, (2) the process of setting standards should be subject to contributions by interested foreign participants, and (3) countries should recognize technical testing and certification of equipment done in other countries.

There is general agreement that virtually all information services should be competitive and that the telephone company should be subject to regulatory controls to curb unfair competitive advantages arising from its monopoly over the basic network. That is where agreement stops. Many countries want value added services—for example, protocol conversion and packet switching—to remain domestic monopolies, while allowing some choice in international value added carriage. The Latin American activities of IVANs such as BT, GE In-

formation Services, Infonet, and AT&T EasyLink Services illustrate this. Other countries allow foreign firms to provide value added services to private corporate networks and to supplement limited public offerings.

Many countries restrict foreign provision of information services in order to boost local industry while others are open. Japan is relatively open. Latin American countries have reached agreement with PanAmSat, a new competitor to Intelsat, for private data and video networks.

PanAmSat is part of another important phenomenon. Countries in the Pacific Basin openly compete to become international traffic hubs. Hubbing brings revenue to support modernization and helps spread costs. It also brings ancillary business as firms move operations to the hub. Many Pacific Basin countries have reached agreements on voice services with all the major U.S. carriers in return for pledges to build traffic flows. One reason Australia converted to competition on basic services is to compete more effectively with Hong Kong, Singapore, and Japan for hub operations. Nations like Indonesia and China have experimented with satellite systems in order to start playing this game.

In short, the domestic politics of services and equipment suggest limited openness for local basic services, some chance for openness in domestic long-distance and value added voice, and greater opportunity for all international services. There is strong potential for international openness in CPE, value added, and information services. Prospects for network equipment are mixed. Meanwhile, the distribution of international power remains concentrated enough to favor liberalization, but there will be a tendency towards very elaborate safeguards and unilateralism.

3.4 Alternative Regimes

Internationalization of firms and a shift to greater openness are likely. The real question is how far the changes will go. This section explores the issue in two steps. It begins with a brief review of the most prominent proposal for minimum change in the international regime. To see if minimal change will suffice, I will then review the changes in the principal users and providers of telecom services and equipment—the United States, Japan, and the United Kingdom, which are collectively referred to here as the Triad.

3.4.1 *Minimum Reform: The WATTC Process*

The smallest degree of change that will occur is what I call “dynamic centralization.” It is embodied in the proposed draft regulations submitted to the World Administrative Telephone and Telegraph Conference (WATTC) in 1989. Standardization will bridge the existing gaps among communications and computer systems around the world; *interconnectivity* is the watchword. In general, the European authorities have favored this approach.

Dynamic centralization expects the traditional phone system to become a powerful public network for completely integrated voice, data, and video ser-

vices available to everyone over broadband, high-speed networks of fiberoptic cables. Competition will play an increased role in two senses.

First, there will be enough reform for policymakers to enhance the credibility of threats of competitive entry if the PTTs do not improve efficiency. One can interpret reforms in West Germany in the mid-1980s along this line. However, many analysts think privatization may be a necessary part of this policy mix (see, e.g., *Economist*).

Second, specialized information services will be offered over the network by new entrants. Some content will be competitive, but the pipe will be a public utility intent on capturing all economies of scale and scope as a way of raising capital. Pricing for network services will be more flexible for large users, but it will still permit cross subsidies supporting expanded definitions of universal service to include some enhanced services to households.

The trickiness of this is suggested by what is happening in Europe. The EEC (1987, pp. 34–35) notes that members disagree on whether packet-switched networks, circuit-switched data networks, teletex, electronic mail, and videotex are basic services.

The 1989 WATTC draft regulations proposed extended international regulation over all new types of value added and information services, and potentially over all entities that use the communications network. This would significantly extend the scope of regulation. For example, some of these services could be declared to be universal public services (UPS) and thereby subject to licensed entry, public tariff approval, and obligations to serve all interested parties. The regulations could also treat the providers like traditional carriers.

The WATTC draft allows some competition for some information services. GATT would presumably provide a framework for competition. (On the GATT initiative for services, see Aronson and Cowhey 1988.)

An examination of the WATTC formula suggests that it rests on a redefinition of jointly provided services, which significantly moves the regime from restrictive regulation toward the internationalization of regulation. It acknowledges that PTTs must rely much more heavily on global customers who demand global services than was true in the past.

The old system of universal service cannot reliably provide much more integrated and flexible services; therefore, it must change. The best example of a successor to jointly provided services is Global Information Movement and Management (GIMM), an ambitious undertaking of AT&T, KDD, and British Telecom, together with several closed users groups such as SITA for airlines.

GIMM assumes underlying basic services will remain relatively closed to competition, although less so than in the past. Nonetheless, the internationalization of customers requires each major national carrier to internationalize by collaborating on the development of common service offerings (involving similar technical architectures, more flexible pricing, and a single account manager who can arrange for services in all three countries). In short, AT&T, KDD, and British Telecom are creating international commercial alliances through GIMM to provide competitive global assets.

Closed users groups are viewed by many regulators as the best way to satisfy

the demands of some very sophisticated and influential groups of users. Organizations like SITA for airlines and SWIFT for banks are recognized under ITU rules as deserving exceptions to rules that discourage the independent supply of enhanced services, such as the prohibition of shared use and resale of circuits. Firms serviced by these closed user groups have common needs that exceed the capabilities of public networks, so it is natural that they should seek to invest in a commonly owned specialized network to serve their particular needs. This limits the proliferation of independent networks, satisfies their strongest demands, and assures every firm in the banking or airline industries that it will have similar international capabilities.

It is unlikely the WATTC approach can prove to be a stable solution for several reasons. The political forces in key financial centers are pushing for more openness than WATTC favors. Customers demand more open competition and globally customized responses than efforts like GIMM can meet. Efforts by PTTs to field "one-stop shopping" for global services to large multinationals stumble over high coordination costs among the partners and corporate cultures built on more protection and less internationalization. One sign of this frustration was AT&T's consideration of buying a minority share of Mercury, Britain's second largest telephone company, in the hope that common ownership might permit more decisive strategies. Closed users groups are somewhat better suited to meeting customer demand, but they are at a disadvantage to fully meet the individual needs of major customers.

There are significant transaction costs problems among the different informatics segments. Information service suppliers want flexibility in the underlying facilities and basic services. CPE suppliers seek to weaken the market for most services because they want their specialized equipment to provide the added functionality, not the phone company. Therefore, users and CPE suppliers will not ultimately be satisfied with the limited coverage provided by GATT agreements intended to liberalize international enhanced services. Finally, as limited competition comes to international facilities, suppliers have fewer incentives to maintain restrictions on use of their facilities than did the old monopoly PTTs.

3.4.2 Alternative Models for Change

Reform means increased international competition is possible. At a minimum, trade negotiations could progress on information services and equipment issues. Many users and providers are not waiting.

Nearly round-the-clock trading has emerged in some types of financial markets—foreign exchange in particular—based primarily in London, New York, and Tokyo. This is both a result of and a force for further rationalization of communications and information systems. A more competitive and flexible information infrastructure is a natural concomitant of globalization of capital.

"Flexible decentralization" is the U.S. vision of this change. Technological innovation will occur on more competitive terms and with a flexible architecture for future services and equipment because informatics is too important to

allow a central network to dominate it. Every country needs one or more public networks with economies of scope in providing flexible interconnection of services. Moreover, individual public networks need a common understanding about how standards will make them interoperable. However, the public network should not exclude the flexible specialization of other networks. Indeed, finding the optimal mix of services even on a wide-band network depends on the ability of buyers and sellers to redesign the pipe, including shifting the point where command over the network resides, as well as to compete on its content. Competition in the underlying infrastructure of network facilities further encourages innovation. If dynamic centralization sees the public network as the highway of the future, the flexible centralization vision argues that there must always be competing highways and alternate modes of communication—just as waterways, roads, railroads, and airports form competing yet complementary networks within the physical transport infrastructure.

The Japanese approach is a hybrid. It embraces competition for facilities and services along the lines of flexible decentralization. It also uses government subsidies and industrial policies to promote a core set of information and video services for every home, which leads to experiments with pricing and network design that are somewhat akin to dynamic centralization. Table 3.1 is a simplified comparison of countries with regard to competition in services and facilities.

Most of Europe has embraced dynamic centralization. The European model probably does not go far enough, but it does not follow that the world market will fit the U.S. model: A Japanese–European understanding could also shape the future. However, the United States is so much a pivot point of trade, investment, and communications for Japan and Europe that sidestepping the United States will be difficult.

Table 3.1. Competition in Services and Facilities, 1991

Europe	Japan	U.S.	Service
No ^a	In theory	Bypass	Local Basic
No ^a	Yes	Yes	Domestic Long Distance
No ^a	Yes	Yes	International Long Distance
Some ^b	Yes	Yes	International Enhanced
Some ^b	Yes	Yes	Domestic VAN
			In the 1990s:
Broad ^c	Broad ^c	Voice	Universal Service defined to include.
High	Mixed	Low	Extent advanced processing functions are concentrated in the central public network.
Low	High	High	Level of facilities competition

^aThe United Kingdom and Sweden permit competition.

^bLimited on data in some countries until mid-1990s. Many restrictions on enhanced voice services.

^cMany enhanced services will be considered part of universal service.

3.4.3 *The United States–Japan–United Kingdom Triad*

The United States, Japan, and United Kingdom had 177 million of the world's 341 million access lines for communications in 1985. They constitute the majority of the world's equipment and domestic services markets. They are only a minority of the international basic services market, but they dominate traffic over the major transoceanic routes (as calculated by the author from data in Kitchen, Lewin, and Schoof 1987).

Countries seek international rules for markets that reinforce their domestic regulatory arrangements. Reform means that most industrial countries want to tinker with international rules, but divergence in their approaches to reform sends them in somewhat different directions.

The Triad has had a sometimes tumultuous, sometimes cooperative relationship when attempting to forge common understandings about the international communications market. U.S.–Japanese bilateral trade talks have been particularly tough and some matters remain unresolved. Still, the three appear headed toward several common positions.

U.S. firms hold varying positions on the best form of change. AT&T is most comfortable with stressing reform of ITU regulations. Both AT&T and the BOCs give higher priority to bilateral talks than they give to GATT. However, they have supported the GATT services initiative except for a strong insistence that the United States not grant unilateral access to foreign carriers to serve the U.S. voice services market. The computer industry strongly supports GATT, but sometimes splits because of feuds between IBM and its rivals on computer communications architectures. Large users and specialized service providers are the most outspoken critics of the ITU. They are also the most sympathetic toward GATT, which they would like to see supplemented by bilateral negotiations.

The Triad have accepted competition in the provision of international basic services and facilities. The United States has three big international carriers and many smaller ones; Japan has three; the United Kingdom has two. Each has accepted "private" international fiberoptic cables that can compete only for the traffic of specialized private networks. The United States and United Kingdom accept private international satellites for specialized services. Japan has accepted a significant ownership role by a foreign carrier, Cable & Wireless (C&W), in one of its international carriers. The United Kingdom planned to allow U.S. carriers ownership and control privileges over basic carriers as long as its firms could do the same in the United States.

The three countries have agreed to curtail traditional restraints on the shared use and resale of international circuits. This makes it much easier for providers of enhanced services to operate between countries. These I-VAN agreements open the way to much freer and flexible networks that tie together the three countries and other interested nations. Foreign ownership of domestic enhanced services is allowed in each country, although the United States accepted more administrative controls over licensing I-VANs than it prefers.

There is also agreement that equipment markets should be open, although implementation may fall short of the goal. The U.S.–Japanese talks established

some very important precedents on the crucial issue of technical standards. The United States has convinced several non-Triad countries to certify equipment as long as it meets the relatively unrestrictive standard of "no harm to the network." It has further advanced the principle of "self-certification" by the supplier rather than relying on a few national testing establishments. It has also obtained a pledge from some countries to set tariffs for leased circuits on terms compatible with the needs of US users and enhanced service suppliers (Aronson and Cowhey 1987).

For all these agreements, there are important differences among members of the Triad. The U.S. exercises fewer controls over enhanced services—for example, allows more licensing—than the other two, and is reluctant to use communications policies as a form of limited industrial policy. Perhaps most crucially, the Japanese Ministry of Post and Telecommunications (MPT) was able to retain control over telecommunications policy after a major challenge by the Ministry of International Trade and Industry (MITI), which represents the computer and general electronics industries. The contest between MITI and MPT is not over, and MPT must write rules that take the MITI position into account or else face another serious challenge.

Many analysts believe Japan's MPT is using international deliberations to strengthen its hand. The MPT insists that all service categories be covered by explicit administrative rules. For example, it wants rules to govern emerging fax networks while the United States insists no rules apply and none are needed. In 1988 Japan declared that all I-VANs had to use the X.75 standard to maximize connectivity and all I-VANs had to offer interconnection to other VANs. The United States protested, saying the regulation prevents suppliers of specialized services from designing proprietary technical standards and choosing their own business partners. MPT subsequently offered to have the United States and Japan jointly design a supplementary standard to X.75 to satisfy both parties. U.S. firms responded that the problem was Japan's insisting on *any* single interconnect protocol; they wanted flexibility. MPT then offered a new formula for protocols and interconnection, which the industry found more interesting, although the U.S. government still found it less than fully satisfactory.

Japan uses its administrative powers over services not only to prevent competition in services but also (and more importantly as a reason) to strengthen its competitive position in the international equipment market. The government spurs economies of scale in equipment tied to selected new service features, particularly the use of optical imagery in conjunction with voice and data systems. However, the MPT strategy continues to raise serious questions about government oversight of the computer industry, and some Japanese electronics firms want more freedom.

3.5 The Emerging Regime

There are three prominent trends in the strategies being employed by companies in the Triad.

1. Service firms are becoming multinationals, and even multinational manufacturers rely on even more integrated global strategies for both goods and services. The strategies, however, often rest on international corporate alliances to supply many of the key goods and products.
2. Firms rely more on joint efforts to create a common technical infrastructure and to do product networking.
3. Firms form international alliances to create important products or to provide a single global effort in markets being transferred from closed to more open environments, such as transoceanic cables or satellite systems.

These trends all involve a shift toward more openness and continued internationalization. At the same time, governments are accepting more international competition and continue with vigorous industrial policies. This in turn suggests that neither traditional approach—a restrictive regime like the ITU or a free trade system such as GATT—can handle the problem. We are in an era when a market-access regime is becoming more central to world order, which poses the troubling problems to be discussed at the close of this chapter.

3.5.1 Creating Global Networks

There are two principal approaches to the creation of global service networks. One is the creation of a network whose primary asset (technical planning) and competitive strategy are anchored on the global strategy of a single firm. The other is that these networks consist of a single firm linking together a series of commercial ventures that are jointly owned and developed with other firms.

Many companies are primarily working on multination domestic strategies, which invest in telecommunications franchises in key nations. For example, Motorola is taking on joint ventures in countries such as Japan and Argentina to supply cellular telephone networks. It has proposed the Iridium low-orbit satellite system as a partnership vehicle for telcos around the world. Each network then becomes a buyer of Motorola equipment.

The two British carriers, British Telecom (BT) and Cable & Wireless (C&W), are excellent examples of the multinationalization of services. BT has focused primarily on enhanced voice and data services with selected CPE, while C&W has covered all services.

BT's initial strategy has specifically led to two apparent results. First, BT is becoming a multinational firm through CPE, particularly items such as PBXs, modems, multiplexers, and high-speed local area networks (LANs). It is doing so primarily by entering local joint ventures in North America and Japan. Second, it is building a global network in value added and information services that complement the CPE market. It purchased Tymnet, a global VAN, to accelerate its provision of integrated global private networks. It also emphasized cellular through moves such as its 22 percent ownership share of the United States' largest cellular telephone system (McCaw, for which it paid \$1.5 billion in 1989), paging, air call services, voice messaging, and voice response systems. Its initial target was the United States, but it is also involved in joint

ventures to penetrate Europe and Japan. It experimented with agreements with AT&T and KDD to provide one-stop shopping for corporate networks, but it may prefer to go its own way.

C&W is building a global digital pipe. It is the leading partner in joint ventures providing private fiberoptic cable systems being installed in the Atlantic and the Pacific. C&W directly owns 30 percent of the Japanese end of the Pacific cable as well as 16.83 percent of the new Japanese international long-distance carrier that owns the other 70 percent. It also owns 20 percent of Pacific Telecommunications Corporation, the majority owner of the U.S. side of the Pacific cable. It holds a 50 percent share of PTAT, the trans-Atlantic fiberoptic cable; US Sprint owns the other half.

C&W owns most of Hong Kong Telecom, and has entered joint ventures for a teleport in Jamaica (with AT&T), cellular phone services in the Caribbean, and a VAN in Australia. It has a share of a long distance resale network, C&W Communications, in the United States.

British firms are not the only ones playing this game. France's Cables et Radio owns slightly less than 15 percent of a U.S. long-distance carrier, FTCC, and a 2 percent interest in International Telecommunication Japan. It also owns a 15 percent share of a new global joint venture for VANs based on the existing network of Computer Sciences Corporation.

Some firms are more concerned with products than are C&W or BT. Both IBM and NEC represent a slightly different approach to creating new multinational strategies for goods and services. Each remains primarily in the equipment business and basically an independent multinational, but both are building global service networks to supplement their equipment sales. Each is also doing more product networking and cooperating on common technical infrastructures. IBM is doing so through a series of national joint ventures, the largest of which is with NTT and Mitsubishi in Japan for VANs. Others are in Italy and France. At the same time, it has been building its own global VAN to interconnect these ventures.

In Japan NEC has the NEC Network, which is a joint venture with companies in the Sumitomo group and two major insurance firms, and its PC VAN. NEC relies largely on its joint venture with GEISCO, a General Electric subsidiary, for its global needs.

Perhaps the most ambitious example of an effort to build intercorporate alliances to yield a family of products is AT&T. AT&T and Philips formed APT, a venture that swapped AT&T digital switches for Philips network transmission products. Frustrations in cracking the European market led AT&T to assume majority (60 percent) control, and then sell part of Philips' share to Italy's Italtel in order to win major equipment orders in Italy. APT also added Telefonica de España as a partner. Each new member would contribute products to the venture.

Meanwhile, AT&T has tried to find a winning combination of ventures for CPE and computers. Its 22 percent equity holding in Olivetti was the most prominent move, but this relationship proved unsuccessful and will be sold off at some future date. It bought NCR in 1991 to fill this gap.

AT&T has joint ventures with Ricoh for digital key systems and Toshiba for

PBX that could contribute to a global product family. Its 20 percent equity in Sun Microsystems (discussed later) was intended to indirectly help build yet another product family. At the same time, it finally got its joint venture in Japanese VANs, JENs, into proper working order to provide the global prototype for other VANs that will complement its CPE offerings. In 1989 it bought Instel, a large British VAN, as a vehicle for creating a European VAN for very high-speed data. The AT&T experience, however, shows that putting together a coherent global family of common products through partnerships is a particularly difficult task because coordination covering a wide range of products is extremely hard to maintain.

Joint technical infrastructures and product networking for sharing know how, developing standards, and cross-selling products are becoming more important because the traditional international process for setting technical standards is no longer sufficient. The intersection of technologies and the integration of the global operations of customers have far outpaced the traditional forums for setting standards. Moreover, many companies want to establish selective arrangements for setting standards in order to establish a dominant market position for their specialized technologies.

Joint ventures to support a common technical infrastructure include efforts to establish a common set of standards among firms and common technical capabilities, but not specific commercial products. Japanese firms have long done this within their own market; now Europe, through the Common Market's Esprit and R&D in Advanced Telecommunications Technology in Europe (RACE) programs, and the United States, through industrial consortia receiving antitrust exemptions and financial support from the U.S. government, are following the Japanese example. U.S. examples are Sematech and MCC. The forces leading to unilateralism should also promote more domestic alliances as safeguards against possible moves by firms from other countries. The growth of domestic alliances in the United States represents a major shift away from classic free trade and toward something more akin to industrial policy.

At the same time, the growing pressure for domestic consortia for technical infrastructure will open up entry to foreign firms. Foreign governments will demand access and foreign firms are becoming increasingly important to the success of any individual country's project. Foreign firms may have unique technological capabilities or detailed knowledge of foreign market conditions that are vital for developing universal technologies. Access could range from rapid dissemination of findings before formal publication and licensing of findings to foreign firms at a reasonable price to actual foreign participation in such consortia.

Foreign firms participate in several of the major research projects sponsored by the EEC. Foreign membership has been secured at last for one of Japan's major projects, Galaxy, for the next generation of computers. Both Univac Japan and IBM are members of the AIST standards committee that is to bring OSI to Japan. Similarly, companies from the United States, Japan, and Europe have joined X/OPEN, a London-based consortium for the development of common software building blocks. Companies from the United States, the United

Kingdom, and Canada joined to promote a preferred set of network management protocols.

3.5.2 Product Networking

Product networking—the creation of families of products, often from a variety of original vendors, but offered as an optional package—has become ubiquitous. Firms require domestic and international partners to create selective interconnectivity among products. They do not attempt product networking on a universal basis either because the task requires sharing valuable proprietary technology or because competitive tensions are too strong to make it worthwhile to attempt to reach a consensus.

A classic example is the Sun Microsystems campaign to standardize future high-speed minicomputers and workstations around its SPARC architecture for semiconductors and Unix software in much the same way IBM made its microcomputer architecture the standard in the early 1980s. It offered equity to AT&T (the original developer of Unix) to consolidate the Unix deal in January 1988. The deal was for up to 20 percent of Sun (15 percent of the company in newly issued shares at a 25 percent premium to the market, and 5 percent AT&T could buy on the open market). AT&T never acquired the full 20 percent. Sun also aggressively licensed SPARC technology to selected U.S. and Japanese firms (Fujitsu and Matsushita). This prompted DEC, IBM, Nixdorf, Siemens, Groupe Bull, and Philips to join a rival consortium for development of Unix. Meanwhile, DEC was busily striking deals with German and Canadian firms to support its new Enterprise Management Architecture for network management. Sun and AT&T ultimately could not agree on how to cooperate, and Sun had bought all its stock back from AT&T by 1990.

When competitors bring out a new technology more or less at the same time, the products will inevitably be incompatible, if not outright noninterchangeable. An excellent example is videocassette recorders in the 1970s, where Sony's first (and in some ways superior quality) Betamax format was soon joined by JVC's VHS. The latter's longer-playing tapes helped make it the dominant standard, and Sony ultimately capitulated. In nonconsumer products, emergence of a single standard is rarely as necessary—as can be seen from the ongoing debate over operating systems and programming languages. Even for commercial products, however, proprietary systems are becoming anachronisms.

Fearing being shut-in by their advances, firms often see open architectures and product networking as important when defining the technologies of follow-on or next-generation products. Even firms that can take almost discontinuous steps in technology find it worthwhile encouraging smaller-scale innovators to follow their bandwagon, even if it means some become competitors in the basic product. Technological pioneers in the past were routinely rewarded with arrows in their backs; the risk now is being trampled in the rush of complementary product producers through a breach in the technological frontier.

Alliances to provide a major product or create a single global competitor are

subject to growing competition from rival alliances. For example; in 1988 U.S.-based Computer Services Corp sold 70 percent of its global network for value added services to PTTs in Europe and Japan. (CSC sold its remaining stake to MCI in 1990.) A vivid glimpse into the logic of PTTs is available in an interview with Gerard Simonet of France's Transpac, the public packet switching network, given to Heywood (1988). Simonet believes this network will provide a common vehicle to implement a single international data network for these countries.

However, other global networks have been mounted by joint ventures involving IBM, GEISCO, and EDS (a subsidiary of General Motors). These compete with the GIMM venture of AT&T, BT, and KDD. For this reason, BT may not join in the purchase of the CSC network. EDS and GEISCO signed an agreement for GEISCO to provide VAN services for EDS in Europe. EDS then announced a new venture with PanAmSat for other new services to Europe.

Telecommunications infrastructure facilities in the global arena, like satellite systems, were traditionally joint ventures operating in closed markets. This is changing rapidly. The international satellite equipment market has rapidly turned into a set of competing global teams led by Ford with Mitsubishi Electric and Alcatel Espace; Matra with TRW, NEC, and Spar; GE with Aerospa-tiale and Messerschmitt; and Huges. Note that all but one of these is U.S. led. Insistence on domestic satellite industries was the principal cause of joint venturing.

The satellite services market will become similarly subject to competition. Intelsat is subject to competition from PanAmSat (a U.S. firm) and Orion (a joint venture involving British Aerospace). Others will probably follow. Intelsat will respond by selling more capacity for domestic services in developing countries, but new competitors will emerge there as well. For example, AsiaSat, a consortia of a U.S.-Canadian firms, C&W, firms from Hong Kong, and China will provide domestic satellite services for the Asian area, including China. This will provide competition to any expansion of Palapa, the Indonesian system.

Restrictions on competition between satellites and cables for international traffic are declining. There is a new generation of joint ventures for transoceanic fiberoptic cables on the major global routes.

3.5.3 The New Regime

In its initiatives on trade in services, intellectual property, technical standards, and rules governing government procurement practices, GATT and corporate strategies are moving closer to what can be called market access regimes. Existing international institutions are scrambling to respond. The ITU is seeking to move toward internationalization of regulation, and is trying to steer corporate strategies for all but information services in that direction. No international framework easily fits a regime that primarily focuses on internationalization of domestic regulation and market access issues.

What will happen? WATTC will modestly modernize and internationalize traditional regulations, but it will fail to substitute international rules for domestic ones. ITU will certainly play a major role in setting technical standards and continue to facilitate coordination of commerce among countries sticking to the monopoly model. It will not halt the broader movement toward more open markets. GATT will succeed in greatly extending its nominal jurisdiction on equipment and enhanced services simply because no major government will tolerate collapse of the major free-trade arrangement. Moreover, these GATT provisions allow many services and goods to become routine free-trade commodities. GATT, however, will not provide a very cohesive regime because it provides no framework for basic services and facilities, and its enforcement rules may not suffice in a market with such high transaction costs.

The most likely development is a high degree of internationalization of firms in the context of various national industrial policies and regulatory regimes—some more committed to competition and free markets than others. This will force more bilateral and minilateral bargains to provide specialized regulatory frameworks among like-minded countries. For example, ITU regulations for international services will likely include an article permitting countries to allow more competition by mutual consent. There is every indication that the United States will demand more parity with its major trading partners in communications services and equipment. Indeed, the 1988 Trade Act mandates this approach; after its passage the U.S. government quickly began considering special restraints on foreign service suppliers in the US if US firms do not get equal access. This may lead countries to bargain over the rights of their international service carriers along long-followed lines in the international airline industry.

It is reasonable to speculate that the United States will get less openness than it demands, but it will force significant liberalization. This may force more active involvement on the U.S. government and more openness on Japan, and there is evidence each country is settling on “open industrial policies” for informatics—open because they are market-oriented and suggestive, rather than cartel-oriented or indicative. It also means the additional opening and integration of the world economy will be accompanied by the decline of universal rules for the informatics sector.

Will Pacific Basin countries be further divided or become more integrated through minilateral negotiations? This depends on whether or not they start to create a major set of international institutions capable of fostering creative economic and political bargains among countries in the region. So far, such regional institutions are weak.

While there are cautious calls for the creation of Pacific-oriented economic organizations comparable to the Organization for Economic Cooperation and Development, all such proposals run into a common problem. The heart of the world market still lies in the Triad of the United States, Japan, and Europe. A more likely outcome, therefore, is minilateral bargaining featuring the major industrial countries and newly industrializing countries that are willing to re-define their role in the world informatics market.

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