New Developments in Telecommunications Services

By Eli M. Noam

Because several of the changes in telecommunications policy originated in the United States under a conservative political regime, they are often viewed as the product of particularly U.S. business interests, wrapped in a Chicago economic ideology, and not relevant to other countries, in particular those of the developing world. But more recently several other industrialized countries began adopting similar policies, or at least discussing some changes that previously seemed unthinkable. This raises the question of whether changes in telecommunications go deeper than the nature of the respective governments in power, and whether they reflect a more fundamental change – a paradigm shift in the function and the concept of telecommunications services – which will reach other countries, too.

This chapter argues that the changes in telecommunications policy are indeed part of a broad transition, in which the traditional notion of the public network – that of a centralized, public-spirited hierarchy – is transformed by a multiplicity of centrifugal forces into one of an open network, a loosely interconnected federation of sub-networks, much like the system prevailing in transportation. These changes, though beginning in highly developed countries, have begun to reach the newly industrialized countries, and, in time, will spread to developing nations and affect the nature of global communications and its coordinating international organizations.

The Hierarchical Network

For almost a century the key institutional feature of traditional telephony in Europe and North America has been a ubiquitous network operated by a monopolist. The operating entity usually was a government administration known generically as a PTT (Post, Telegraph, and Telephone authority). In United States telephony, AT&T fulfilled much of the same function. Colonial powers spread the system globally, as it followed their flags.

The underlying concept of the public network was benign but authoritarian. It was centralized, orderly, planned, and monopolistic. In some countries, its employees wore uniforms. The layout of the network was centered around a "switching hierarchy". Policies were set by technical experts rather than by "politicians", and largely outside public scrutiny. The PTTs usually derived their budgets and set investment plans outside of normal parliamentary appropriations. To be sure, it was a benevolent form of authoritarianism, since it served the

important goal of interconnecting society, and operated as a mechanism of redistribution. The public network was not merely a technical system, but a social, political and economic institution based on the sharing of resources and the transfer of benefits towards favored groups. These were often the economically weak, and almost always the middle class.

Because the public network is a social system, one must go back to its origin. The origin of the hierarchical network system preceded electronics and telecommunications by centuries, and lies in the emergence of postal monopolies. A key date is 1505 when the Hapsburg Emperor granted exclusive mail carrying rights to what one would call today a transnational company, the Italian firm of the Taxis family. This concession proved to be an unexpectedly rich source of revenue to the Hapsburgs, who shared in the profits, but it also required vigilant protection from the incursion of mail systems, of which there were a multitude (Dallmeier 1977). Neighboring Prussia went one step further, and in 1614 set up a state-run monopoly postal system (Stephan 1859).

Thus was the PTT system born. It was a creation by the absolutist state for the absolutist state, and based on some of the same impulses that led to colonial expansion. While much later this system was rationalized as based, depending on one's point of view, on economies of scale, national sovereignty, cross-subsidies, or public infrastructure needs, the early creators of the postal monopoly system were quite forthright in their mission to make profits for the state and its sovereign. The postal system became a major source of revenue, just at a time when European rulers had insatiable needs for them. This goose with its golden eggs became ardently protected, through the centuries, against encroachment by private competitors and by other states.

When the telegraph emerged in the 19th century, it was rapidly integrated into the monopoly system. When the telephone made its appearance in 1876 it, too, was soon integrated into the state monopoly, once its financial viability became clear. Here, the official story is that the purpose was to bring telephony to rural areas neglected by commercial interests. This is sometimes true, but in other instances the historical record is quite different. In Norway, for example, private firms served the countryside while the state system took for itself the more profitable cities. At the same time, telecommunications were also integrated into an international system of collaboration, with the official goal of technical coordination, but also, from the beginning, with a cartel agenda of price setting.

For almost a century a tightly controlled telecommunications operation was in place in most advanced countries. Its structure was supported by a broad political coalition. This "postal-industrial complex" included primarily the government PTTs as the network operators and the equipment industry as their suppliers, together with residential and rural users, trade unions, the political left, and the newspaper industry whose postal and telegraph rates were heavily subsidized.

The system worked in particular to the benefit of the equipment industry. The PTTs, through their huge procurements, especially after World War II, provided large markets for the industry. Even better, these markets were almost totally protected from foreign competition by buy-national policies. Within most advanced countries, domestic equipment manufacturers often collaborated with each other in formal or informal cartels which set prices and allocated shares of the large PTT contracts. This system was very profitable for the insiders, but its inefficiencies were hidden by the general downward trend in the cost of electronic technology (which was pushed more by the computer and component sectors than by the traditional telecommunications firms). Thus, the PTT system is based on the particular constellation of powerful interest groups in industrialized countries, whose relevance to developing countries is only marginal.

While the system operated to the economic advantage of equipment firms, it also enjoyed broad public support. The hierarchical network concept is one of public service: universal in reach, common-carriage in access, rate-controlled as a necessity, and redistributive in charges. As a public service telephony was outside the mechanism of the market, even in otherwise free-economy countries. Any change in that status was bound to be controversial; historically, any expansion of the realm of the market into the realm of rights and politics has been painful.

Society formally or informally excludes many transactions from regular market operations. But it is difficult in practice to stem the encroachment of economic transactions which favor those with superior resources. Surrogate pregnancies, political advertising, a hired military, and private education are increasingly accepted, but each instance is controversial on principle grounds. A relocation of telecommunications from the realm of public service into the market system is similarly objectionable to many, and this preference is a legitimate argument. Yet others advocate the PTT system on more pragmatic grounds as necessary to assure universal service to the entire population. This view incorrectly extrapolates relatively recent priorities of investments to be the historical norm. In Germany, for example, in 1960 only about 5% of households headed by skilled workers had telephones, and the percentage was even lower for unskilled workers.

Forces for Restructuring

The centralized model of the public networks has been subject to forces of centrifugalism. Technology is one of the reasons, though its contributions tend to be exaggerated. It is not microwaves and satellites that have suddenly made long distance competition possible. The following is a list of the factors of centrifugalism. It should be said at the outset that to observe these forces of change is not necessarily to advocate many of their manifestations. Defenders of the traditional network system have no monopoly on social concerns.

The driving force for restructuring of telecommunications has been the phenomenal growth of user demand for telecommunications, which in turn is

based on the shift toward a service-based economy. The large users of telecommunications are corporate headquarters, banks, insurance firms, airlines, health delivery organizations, engineering and consulting firms, law, offices, media organizations, and other providers of services. The shift towards such activity in highly developed countries was partly due to their loss of competitiveness in traditional industrial mass-production functions vis-a-vis newly industrialized countries. It was also partly due to a large pool of educated people skilled in the handling of information. In developing countries, too, services have increased in importance, both due to domestic developments and the activities of large international firms.

These activities were reinforced by productivity increases in information transactions through computers and advanced office equipment. In consequence, electronic information transmission, i.e. telecommunications, became of increasing importance to the new services sector. It also became a major expense item. This, in turn, led to the emergence of the new breed of internal telecommunications specialists whose function was to reduce costs for their organizations, and who, for the first time, established sophisticated telecommunications expertise outside the postal-industrial coalition. These specialists aggressively sought to establish low-cost transmission and customized equipment systems in the form of private networks of power and scope for beyond those of the past. These private networks are carving out ever-larger slices from the public network. Such activities are spearheaded by private firms, but are not exclusive to them; non-profit institutions such as hospitals and universities, and public organizations such as state and local governments have also been active.

By their very nature and tradition, the traditional PTTs provide standardized and nationwide solutions, carefully planned and methodically executed. In the old days, sharing a standardized solution was more acceptable to users, because the consequential loss of choice was limited, and outweighed by the benefits of the economics of scale gained. As the significance of telecommunications has grown, the costs of non-optimal standardized solutions began to outweigh the benefits of economies of scale, providing the incentive for non-public solutions. Furthermore, some users began aggressively to employ a differentiation of telecommunications services as a business strategy to provide an advantage in their customers' eyes, and therefore affirmatively sought a customized rather than general communications solution. This, too, will unavoidably happen in those developing countries whose economies permit the competition of private firms.

The number of groups in society that interlink by telecommunications is large, and their communications needs become specialized. This leads to the emergence of user clusters. Early examples are travel agents and airlines, automobile parts suppliers, or financial institutions, all of which have established group networks that combine some economies of scale with customization of networks. We are only at the beginning of this development which will create numerous semi-private networks, which in time will lead to functional networks transcending national boundaries, rather than territorial networks of nation-states.

The globalization of commerce not only increases the importance of telecommunications and the pressures of competition. If one country's PTT exercises restrictive policies, its economy will be disadvantaged internationally, and foreign firms may choose not to domicile themselves in the country. Similarly, acquaintance with options available elsewhere create, by their demonstration effect, pressures for change across borders. Hence the ability of purely national policies diminishes as its indirect costs increase.

For satellite transmission, the marginal cost with respect to distance is virtually nil. Fiber-optic links have also lower distance-sensitive costs. The implications are that communication flows can be routed in indirect ways to circumvent regulatory barriers and restrictive prices. Arbitrage becomes easily possible, and with it the incentive for a country to liberalize its regulatory regime to become a communications "haven". This undermines attempts administratively to price and collectively to set rules for international telecommunications. Such a role can be played by some developing countries, in the same way that they have done in ship registration or in sheltered banking.

Users have increasingly gained control over the network segments closest to them; first, over equipment on their premises; second, also over the wiring segments in office buildings. It was natural, as the next step, that in the US some landlords have begun providing a full array of telecommunications services within their building to commercial tenants thus taking this segment out of the public network. The shared services, by their economic logic, will not end at the property lines, but will expand to clusters of office buildings and central business districts, thus in effect creating alternative local telephone companies.

Because there are several transmission technologies, it becomes increasingly difficult for one organization to control them all. In long-distance communications, the PTT exclusivity for the larger countries is already upheld more by politics than by economic or technological advantages. For local distribution – in the past the segment with the greatest characteristics of "natural" monopoly – several different transmission technologies have emerged, including the use of coaxial cable television networks, stationary cellular radio, microwave multipoint distribution, fiber-optics, infra-red transmission, etc. (Noam 1985).

Traditional telecommunications networks and equipment have increasingly become contiguous and overlapping with previously separate sectors such as computers, office equipment, and broadcasting. Boundaries became blurry, and challenged the PTTs' exclusivity. In France, for example, the governmental broadcast organization TDF has its own satellites, to be used for direct broadcasting, but with the potential for other services which have been previously the domain of the telecommunications monopoly DGT. The DGT, on the other hand, is the most active element in the creation of cable television distribution networks, moving into TDF territory. In Indonesia, the domestic satellite system led to similar overlap of central functions.

For a long time the primary mission of PTTs had been to establish a network that would reach every household, and this benefited also the supplying industry. However, by the 1980s the goal of universal service was largely achieved in Western European countries. In Germany, for example, penetration in 1960 was 12%; by 1980 it was 75%. Having been successful in spreading telephony, the PTTs were now left without a clear mission, and the supplying industry was in danger of greatly reduced demand for equipment. This led to a turn to Integrated Services Digital Networks (ISDN), videotex, and more generally towards advanced business services. This shift is rarely openly admitted, given the traditionalist ideology; for example, videotex is generally described as a consumer information service, whereas its predominant use is in offices, with the notable exception of France, where the equipment is heavily subsidized.

For all of these and additional reasons, the public networks are subjected to centrifugal forces that tear at the traditional unity. Like a Greek drama unfolding, the unified system of the hierarchical network unravels because it reflects the realities of a passing era. However, the traditional system still has politics on its side. It still encompasses several main organized constituencies. But the new interests create their constellations, too. Another coalition is emerging: the alliance of the large users together with that part of the equipment industry that consists of the more recent electronic industry of computer, component and office equipment firms. In the United States, classic members of this "second electronic coalition" would be American Express, IBM, Time Inc., United Airlines, Citicorp, etc.. Opposed among private firms was primarily AT&T– not enough to stem the tide by political force.

In Britain, the new coalition was slower to gather due to the relative weakness of the advanced electronic industry, while the defense by the traditional alliance was more tenacious and ideological. However, once the government withdrew its support from the traditional arrangement and instead blessed the service sector by targeting London as the service capital for all of Europe, the postal-industrial complex had to compromise. A similar story can be told for the Netherlands. In Japan, where the first electronics industry has transformed itself better than anywhere else, into the second, the changes were smoothest, since the equipment industry did not stand to lose much. In most developing countries, there is no traditional telecommunications industry to overcome.

The New Open Network Model

The centrifugal forces lead, over time, to a new network model. We are merely at the beginning of what will be a lengthy process of change. What are the main principles of the evolving system? Some main points are sketched below. The new system is characterized by a great deal of openness: of entry (be it as a carrier, specialized service providers, or equipment vendor), of interconnection into other networks, and of access to many other networks, and of technical standards.

The future network concept is one of great institutional, technical, and legal complexity. The network environment will consist of an untidy patchwork of dozens or even hundreds of providers, serving different geographical regions, customer classes, and service types, with no neat classification or compartmentalization possible. To the tidy mind of traditionalists this is heresy.

The central characteristic of the open network model is substantial lack of central control. Instead, the network becomes a composite of numerous separate planning decisions, moving from the model of the planned system towards an "invisible hand" mechanism. This notion is so alien to the engineering world-view of traditionalists in telecommunications as to strike them as bizarre. The traditionalist perspective was that of chain of command, long-range planning, and integration. "The system is the solution" was AT&T's battle cry. To leave this system to the vagaries of hundreds of uncoordinated and selfish actors seems to invite disaster. Can it work? Perhaps this is not the right way to frame the question. Can there be a stable alternative in economies that otherwise substantially favor a market mechanism, and which want to stay on the leading edge of applications? In any event it is quite likely that the PTTs will exercise market leadership for a long time and thus provide the backbone around which private actors will plan and standardize. Hence some central control will continue.

The traditionalist system was international in the sense of a collaboration on the level of government organizations. It held together well because of a similarity in views in industrialized countries – the values of engineering and bureaucracy – because of a common interest to protect the domestic arrangements, and because the Developing World went along with organizational structures which happened to benefit First World export interests. But in the age of satellites, internationalism became a threat. International communications are the soft underbelly of domestic service monopoly. In the long run telecommunications will transcend the territorial concept, and the notion of each country having territorial control over electronic communications will become archaic in the same sense that national control over the spoken (and later the written) work became outmoded. This will raise substantial new problems, including that of the transnational telecommunications firm.

The public network will not cease to exist. It is likely to remain the backbone of the system, a prime standard-setter, and fully deserving public support, but without the exclusivity that characterized it for over a century. This is comparable to transportation. A state railroad system exists in most industrialized countries, but it is supplemented by a mixture of private and public trucking, airlines, barges, passenger automobiles, and small railroads. Few will advocate a pure state transportation system which encompasses the banning of all private transport just because it reduces the scope and revenues of railroads. Thus the telecommunications system will evolve into a mixed public-private arrangement, reflecting the rest of the economic system in each country.

Whereas in the traditionalist model standardization was a key element, the new model is characterized by a stress on interconnectivity. The difference is that between *ex-ante* and *ex-post*. To reach or maintain agreements on standards, except for very broad issues, will become increasingly difficult as the number of interests and participants multiplies. Instead, standard setters or coalitions will emerge around which other actors will cluster, since incompatible services will not usually be attractive to users. But the system may not be fully convergent. Some parallel series of varying network standards are likely. Fortunately, electronics are flexible; a brisk industry of information and protocol arbitrage from one standard to another will emerge. It was always questionable whether the technical standards framed for industrialized countries were in the best interest of developing nations whose priorities were different. Hence, a world with flexible standards options can hold major advantages in a heterogenous world, as long as interconnectivity can be achieved.

A key requirement for an open network system is that it extends the crucial common carrier principle from users to networks, i.e. that networks can interconnect into other networks, even if they are competitors. This is the key requirement for the functioning of an open system. Both in the United States and the United Kingdom the establishment of interconnection of new networks into the existing and predominant one turned out to be essential. In the Philippines, similar rules apply. This principle requires, however, clarification of the charges for interconnection, and this is likely to remain a regulatory question for a long time. The extension of the principles of interconnection to the international field is one of the more difficult tasks ahead.

The traditional public network operated with the obligation of universal service, i.e. virtually any interested customer had to be served, regardless of location. In the open network system the question is whether universal service obligations apply to all participants. The answer is likely to be differentiated. For some of the more specialized services, the obligation will not exist. But for "basic" service it will continue, and the definition of "basic" is likely to expand. The boundary line is likely to be an ongoing issue of policy discussion. One main function of the public network will be to function as the service provider of last resort, under financial arrangements that may involve subsidies by the government and the private carriers.

Telecommunications is in the midst of an historical process of moving from one of the most regulated industries to one of the least controlled. There are several reasons for this. One is that the increasing complexity of the system makes it increasingly difficult to structure consistent rules. Secondly, rules are not likely to be enforceable. The subject of the controls – streams of electrons and photons, and patterns of signals which constitute information – are so elusive in physical or even conceptual terms, and at the same time so fast and distance-insensitive, that a regulatory mechanism, to be effective, must be draconian, and for that the traditional system has neither the will, nor the political support. What this means

is that telecommunications will move to a significant extent out of the realm of the political process.

In an open network system it is unlikely that the traditional system of internal transfers from one class of users to others can be maintained. But this does not spell out their end. There is still ample reason and opportunity to subsidize some categories of service or of some user classes, just as in the case of railroads. Services for that subsidy can be raised and distributed in the normal way of taxation and budget allocation in which redistribution takes place in society. It is incorrect to consider a monopoly as essential for redistribution. Their justification is still strong, for reasons of general social policy, of regional development, and because of the positive externalities which additional subscribers give to the other subscribers. These transfers are likely to be undertaken by outright governmental subsidies, both to service providers and to individuals as well as by tax assessments on telecommunications providers who do not themselves fulfill a social service role such as rural telephony or low-traffic public telephones. Nevertheless, the subsidies will be smaller once they are open to scrutiny and parliamentary debate. It is likely to emerge in a more targeted way towards the poor. The remainder of residential users will be forced to pay more, and they will also use the telephone more as its applications grow, making telecommunications a bigger budget item.

In this open system there will be more choice, but less equity. Whereas in the past all subscribers had a fairly similar quality of telephone service and equipment the open network system will have much variation, depending on the preferences of customers and their willingness and ability to pay. There will also be a much greater differentiation in the cost of communications. What will be less of a problem is a decline in universal service by subscribers dropping off due to the higher rates than before. Given the low elasticity of demand and the increasing importance of telephone, the drop-off from service is not likely to be the problem, but rather the negative distributive consequences.

Once the notion of the centralized network is breached in some respects, the process is hard to contain. The process is inevitable not because it leads necessarily to a superior result, but rather because the hierarchical network is an anomaly, though one too familiar to notice. As long as the economic system of Western industrialized democracies is based on markets and private firms, the exclusion of major economic parties from a major field is an unstable affair. It is hard to keep a dichotomy between telecommunications and the rest of the economy. The reference to infrastructure service is too vague to be useful here. Telecommunications, unlike a lighthouse or a road, is not a public good in the classic sense: users can be excluded and charges can be assessed, breaking the two conditions for public goods. Nor do the externalities of network participation require a hierarchical system: taxation and subsidies can be at least as effective.

The traditional public network was an appealing concept to many as an almost romantic idea amidst the chill of capitalism. It was a notion of sharing and of

interconnecting, of reaching every member of society almost instantly. Yet these are also the notions of authoritarianism of both the right and the left. Certainly the historical origins of the system, rooted as they are in the 17th Century absolutism, and representing today a near-perfect example of state monopoly capitalism, do not support those who view its defense today as a progressive act.

Conclusion

In developing countries, in particular, the interests of telecommunications users – large and small – and of network operators are quite distinct from those of the equipment manufacturing industry, which are mostly large Western firms with multinational interests, and with intimate links to their home governments that tend to be their largest customers. Hence for developed countries to emulate a rigid PTT system is to follow a course whose efficiency is increasingly questioned in the home territories of its strongest proponents. In these domestic struggles international support from the developing world is sought by the beleaguered PTTs. But it is far from clear why the LDCs, who have no telecommunications manufacturers of their own, would be best served by clinging to past institutional frameworks, just as these are changing to greater openness, flexibility, efficiency, and political accountability. The changes in telecommunications are part of an historical transformation based on technology and economics, and they provide the developing world with institutional and technical options to choose from where in the past only one imparted model was available.

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