

COMPUTERS AND COMMUNICATIONS: THE ECONOMICS OF INTERDEPENDENCE

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INTRODUCTION

The growth of computer centers into regional, national, and international information networks is gaining momentum. The function and capabilities of these networks obviously vary. Some serve as remote batch processing centers; others operate as time-shared centers; many act as data collection and dissemination centers; a few distribute computer power in a manner not unlike the load-sharing of electrical energy. Whether called remote access information systems, teleprocessing, or computer utility services, the fact remains that computer and communication facilities are finding themselves increasingly interdependent—an interdependence that carries with it several questions that have surfaced as issues of public policy.

The purpose of this paper is to explore these issues (1) by identifying the growth of remote computer-based services, (2) by examining the growing interface between computers and communications, and (3) by outlining the diversification of both computer and communication firms into markets that are directly competitive. The policy problems inherent in the interface and diversification issue go to the structural core of the communications common carrier industry. They have been examined not only by the Federal Communications Commission (FCC) but by a Presidential Task Force on Communications Policy as well.

I

THE GROWTH OF REMOTE COMPUTER-BASED SERVICES

As a fairly recent phenomenon the growth of remote computer-based services focuses upon the concept of computer time-sharing. Time-sharing permits several users to exploit simultaneously a central computer facility, thus representing a break from conventional or batch processing methods of computer operation. Each subscriber may use a central computer facility for conversational, debugging, or remote batch processing, and each is under the impression that he alone has access to the computer's logic and memory capability.

The key to time-sharing as well as other on-line data service is the term "remote." The user no longer needs to be located adjacent to the computer site, but can gain access to the computer via a remote terminal attached to telephone or telegraph lines. The development of time-sharing has led many to predict an upsurge in computer

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usage, particularly as the sharing of overhead costs translates into lower prices. The expectation is that remote teleprocessing will make digital information services available to the school, the home, the laboratory, and the firm on a fairly common basis.

Certainly the growth projections of time-sharing and other computer services are impressive. From a revenue base of some \$70 million in 1968, the commercial time-sharing market is expected to exceed \$1 billion by 1973; by the mid-1970s some seventy-five per cent of the nation's computer systems are expected to possess time-sharing capability; by the same time period some fifty per cent of all computer systems will be tied to the nation's communication lines. Finally, the communication carriers expect their nonvoice traffic to exceed their voice traffic within the next decade.¹ Indeed, there is some indication that we are witnesses not merely to a new service but to the growth of a unique industry, separate and apart from either the communications or the computer industry as we know them today.

II

THE INTERFACE ISSUE

Given the growth of time-sharing and given the rise in remote computer-based services, it is perhaps inevitable that a new class of user is becoming an important segment of the carriers' demand function. These users, differing from the residential telephone subscriber, are knowledgeable, possess considerable communications expertise, and are, above all, articulate. Moreover, as communications expenses become an increased proportion of systems costs, they tend to set the limit to market penetration. The result has seen communication practices and customs subject to an unprecedented reappraisal and review. The fact that carrier practices are embodied as filed tariffs, dating back in some cases fifty years, is apparently of little consequence. Questioning and reappraisal are the order of the day.

A. The Foreign Attachment Tariff

A prime example of a carrier practice under fire is the rule that prohibits customer equipment from being attached to the public telephone network—a rule that extends to the interconnection of private microwave or other user communication facilities. These tariffs, known as the foreign attachment and the interconnection tariffs respectively, have been defended on several grounds. The carriers submit that control and ownership of equipment cannot be separated from their responsibility of operating a nationwide telephone system; that ownership is required to insure innovation of new products and maintenance of existing switching and terminal

¹ See *Whole New Market*, FORBES, July 1, 1969, at 43; Osterman, *A Study in Commercial Time Sharing*, AUERBACH, Dec. 11, 1968, at A-1; Irwin, *The Computer Utility*, DATAMATION, Nov. 1966, at 22. See also *Regulatory Decisions Affecting the Data Processing Community: The Federal Communications Commission*, in PROCEEDINGS OF INTERNATIONAL DATA PROCESSING MANAGEMENT ASSOCIATION 344 (June 1968).

hardware; and that control of equipment is essential to protect the quality of the telephone switched network.

Critics of the foreign attachment tariff assert that the carriers are effecting a tie-in between lines and equipment, that such a tie-in rests essentially on rate base economics alone, and that the extension of a regulated monopoly into the hardware or terminal market, given the carriers' ownership of manufacturing affiliates, is at best questionable and at worst anticompetitive.

The validity of these arguments aside, the point remains that established carrier procedures have now been challenged by a new user class—a class seeking the advantages of equipment choice, price, and performance, as well as the option to own related communication apparatus.

B. Public Policy

As more and more remote terminals use telephone lines to tie into central computer facilities, the interface issue assumes a significance all its own. Indeed, the carriers' foreign attachment and interconnection tariff has erupted in two FCC proceedings, the Computer Inquiry² and the *Carterphone* case,³ and has merited the attention of a Presidential Task Force on Communications Policy.

Launched in 1966, the FCC Computer Inquiry found both suppliers and users calling for a re-evaluation of carrier tariffs banning customer-owned equipment. Some respondents asked that the tariff be banned outright; others recommended that the carrier publish technical performance standards, on the premise that specifications would prevent customer-owned devices from degrading the quality of the telephone network. What users and suppliers were both seeking was a "plug" or "socket" concept that would enable a host of information appliances to have access to the switched telephone network without harming that network.

About a year later, the FCC Computer Inquiry was superseded by the *Carterphone* case. This case began when the Bell System objected to a coupling device—the Carterphone device—that permitted a private mobile system to tie into the toll telephone network. When the case reached the Commission, after first appearing in the courts, it was clear that the Carterphone device constituted a direct violation of American Telephone and Telegraph Company's (AT&T) foreign attachment and interconnection tariff. The dispute was thus clearly joined.

In this decision the FCC ruled that not only should the Carterphone device be allowed on the switched telephone network but implied that it had never sanctioned the tariff in the first place. This ruling, perhaps as startling to the computer industry as it was disappointing to the carriers, prompted AT&T to file several rounds

² Regulatory and Policy Problems Presented by the Interdependence of Computer and Communication Services and Facilities, 7 F.C.C.2d 11 (1966) [hereinafter cited as FCC Computer Inquiry].

³ Use of the Carterphone Device in Message Toll Telephone Service, 13 F.C.C.2d 420, *aff'd on re-hearing*, 14 F.C.C.2d 571 (1968). For an excellent discussion of the foreign attachment tariff, see S. MATHESON & P. WALKER, *COMPUTERS AND COMMUNICATIONS: IMPLICATIONS FOR PUBLIC POLICY* (1969).

of tariffs permitting the connection of user-owned acoustic couplers and PBX systems as well as extending the interconnection privileges to private microwave.

Viewed from the carriers' perspective these changes were unprecedented. Nevertheless, these new filings remain beset by controversy. Some respondents are disappointed that the carriers have not published technical standards; others argue that the carrier was not justified in excluding "network control of signalling devices"—the telephone dialing unit—from the new tariff; and the Justice Department has asserted that the burden of proof on banning subscriber equipment should rest with the carrier rather than with the user.⁴ After several attempts to negotiate these differences through informal meetings and conferences, the FCC has turned to the National Academy of Sciences for counsel and guidance.

III

THE DIVERSIFICATION ISSUE

A second policy question focuses on market diversification. This question encompasses several intriguing issues: May private firms employ computers for the storing and forwarding of record messages? May commercial firms render both computer switching and data processing service simultaneously? And may the common carriers as regulated entities diversify into remote computer-based service? Our discussion will begin by considering the diversification efforts of both computer firms and the common carriers.

A. EDP to Communications

It is somewhat rare for firms to engage computers to perform a pure switching function. In most cases computers route record messages as well as process data—thus exploiting a dual communication/computer capability. While corporate in-house use of such services is common, the packaging of both communications and data processing as a commercial service is controversial. On this issue, communication common carriers have expressed some apprehension that firms engaged in routing of messages border on "third-party switching" and hence touch the essence of a regulated communication service. The carriers assert that such switching be confined to regulated utilities alone, and that entry by nonregulated firms into a regulated activity erodes the very concept of a public utility offering.

By contrast, the computer industry suggests that advances in computer technology make the so-called communications/data marriage inevitable, that the public needs and demands such services, and that to deny the data-processing industry an opportunity to both route and process data is tantamount to ruling that a computer can be programmed to add but not to subtract.⁵

⁴ See D. Baker, "Computers, Communication and Competition," a paper presented to a symposium on The Computer Utility: Implications for Higher Education, University of New Hampshire, May 5, 1969.

⁵ Simonson, *Communication Needs of Remotely Accessed Computers*, in AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES, PROCEEDINGS OF THE FALL JOINT COMPUTER CONFERENCE (1967).

A recent dispute between the Bunker-Ramo Corporation and the communication carriers makes this quarrel more than academic. Bunker-Ramo sold a stock market information service that utilized a central computer feeding stock quotations over the telephone lines. In so doing the firm leased telephone lines together with its data processing services, selling both as a package to its subscribers in the brokerage industry. Subscribers in turn queried the computer from remote terminal sets. Put in jargon of the industry, Bunker-Ramo sold a computerized information service on a remote access or real-time basis.

A problem of definition and diversification erupted when Bunker-Ramo attempted to introduce a new service that grafted computer message routing to its information data base. The carriers regarded this activity as competitive with their own teletype services, contending that the element of communications was sufficient to classify that activity as limited to regulated entities alone.⁶ By refusing to lease lines until the Bunker-Ramo service was altered (the routing of administrative data was eliminated), the carriers forced Bunker-Ramo to abandon its new service.⁷

A not unrelated subset to the hybrid computer/communications services is the growth of facsimile transmission. Here, private users lease dedicated lines, drop facsimile terminals at various locations, and in turn pick up and deliver documents from facsimile service to the general public. In this particular case, Western Union has asserted that such activity qualifies the service as a common carrier activity subject to the Communications Act of 1934.⁸ Some facsimile firms have agreed with this interpretation, while others have denied it.⁹ The point remains that the growth and expansion of remote teleprocessing services—data or graphic—carries with it the question as to whether such services are limited to firms possessing licenses of public convenience and necessity.

B. Communications to EDP

The movement of communication carriers into data processing services represents the inverse side of the diversification issue. This side also poses several questions: What is the vehicle for carrier diversification into data processing? Which segment of hybrid communication/EDP services should be tariffed? Should carrier participation in remote teleprocessing be permitted in the first place?

⁶ Letter from Bunker-Ramo Co. to the FCC, March 12, 1965. See also letter from Western Union Tel. Co. to the FCC, regarding computer lease and service arrangements, March 14, 1966.

⁷ For a more detailed discussion, see Irwin, *Time-Shared Information Systems: Market Entry in Search of Policy*, in PROCEEDINGS OF THE FALL JOINT COMPUTER CONFERENCE, *supra* note 5, at 513; Smith, *The Interdependence of Computer and Communications Services and Facilities: A Question of Federal Regulation*, 117 U. PA. L. REV. 829, 847-53 (1969).

⁸ 35 TELECOMMUNICATIONS REP., May 19, 1969, at 23-25. See also *Getting Mail by Phone*, BUSINESS WEEK, Sept. 28, 1968, at 158; *FCC Set to Control Facsimile Companies*, ELECTRONIC NEWS, May 5, 1969, at 2.

⁹ See *His First Million in Sight*, BUSINESS WEEK, May 24, 1969, at 94.

Although the carriers possess several alternatives, it is convenient to classify their diversification efforts as horizontal or vertical. The horizontal approach occurs when a carrier, as a carrier, offers a remote teleprocessing service to the public either on a tariffed or nontariffed basis. Presumably the latter is the approach employed by two international record carriers—offering both processing and switching to subscribers on a contract basis. In the domestic market, an abortive merger and now a joint venture by Western Union and Computer Utilities Inc. also fits this category.

Moreover, a recent Western Union tariff, SICOM and INFOCOM, borders very close to the horizontal approach.¹⁰ SICOM consists of shared computers and lines leased to subscribers in the stock market industry; INFOCOM is a generalized version of sharing to all private leased customers. Some data processing firms have been apprehensive that such a tariff was indeed a prelude to the telegraph company's move into remote data processing services—an apprehension put to the FCC.

When considering the tariffability of SICOM, the Federal Communications Commission had to dispose of a threshold question—namely, was Western Union offering data processing or was it offering communications? From the record, the Commission concluded that SICOM constituted a legitimate communications activity. Nevertheless, the FCC, in commenting on the possibility that data processing might sometime be added to Western Union's services, cautioned:

We believe that substantial and different questions would be raised with respect to the propriety of the tariff if there should be any broadening of the SICOM offering by the addition of a fourth computer or any other means whereby W.U. would perform or offer to perform non-communications data processing as a part of the package SICOM Service. If this should occur, the tariff may be subject to rejection and, in that event, we would expect to take such corrective action as may be deemed necessary, either upon our own motion or upon complaint.¹¹

A subset to the horizontal approach may occur when a carrier takes the last step, namely files a tariff for a remote teleprocessing service on the assumption that such services are genuinely regulated in nature. To the extent no tariff has yet been filed, this issue, or perhaps more accurately this confrontation, has been postponed. If such a tariff is filed and accepted by the FCC, that acceptance serves as a precedent for other carriers including AT&T. At the present time the Bell System's participation is conditioned by an antitrust consent decree; and Bell has announced that it does not intend to engage in teleprocessing services.¹²

Firms in the computer industry are less than excited with horizontal diversification. Most caution that if the carriers offer remote teleprocessing such diversification should be premised as a contract or nonregulated service, adding the codicil that regulatory bodies must ensure adequate accounting safeguards between the carriers' regulated and nonregulated markets.

¹⁰ Western Union Tel. Co. Tariff, FCC No. 251, Applicable to SICOM Service, 11 F.C.C.2d 1 (1968).

¹¹ *Id.* at para. 46.

¹² Irwin, *The Computer Utility: Competition or Regulation?*, 76 YALE L.J. 1299 (1967).

The other diversification route is for carriers to establish data processing affiliates, separate and apart from their communications parent. Both the General Telephone and Electronics Corporation and the United Utilities System have taken this route.¹³ Presumably, such affiliates reside beyond the pale of direct regulation; and presumably the vertical approach resolves any problems, anticompetitive, or regulatory.

Both approaches, horizontal and vertical, are not without their hazards. In the former case carriers are selling services derived from a common plant to different customers. Perhaps modern day accounting techniques make this a false issue, but assigning specific costs to specific services lends itself neither to precision nor agreement and can border on the arbitrary—even when all costs are confined to regulated services. Joint cost separation, in short, is one of the frustrating burdens of regulation. And if the computer industry sanctions horizontal diversifications by the carriers, they may find themselves literally asking the FCC to assume the burden of cost separation between regulated and nonregulated services as a means of ensuring fair and equitable competitive conditions.

The horizontal approaches touch a second problem. Carriers may possess competitive advantages in being able to sell data processing and communications as a total package offering. The computer or data processing industry on the other hand may find itself restricted to selling only the data processing segment with subscribers necessarily turning to the carriers for the remaining segment, transmission lines.

Finally, the computer industry may be placed at a competitive disadvantage when it leases communication lines from firms with whom they actually compete in the marketplace. This is the issue of internal line discounts, and it exists within the computer industry as well as the carrier industry. Undoubtedly regulatory authorities would be under pressure to ensure that no price discrimination takes place when carriers sell lines to themselves or to their customers.

The vertical approach is not necessarily a neat way out of the dilemma cited above. The fact remains that the carriers are not required to purchase their equipment, supplies, or services on a formalized competitive basis. Data affiliates may sell service to captive telephone carriers who in turn post the cost as operating expenses. Under public utility accounting, regulated utilities are entitled to recover this expense from subscriber revenues. The problem here is that it is not inconceivable that carrier affiliates may, through an insulated market—namely the affiliate's parent—diversify into competitive or nonregulated markets. Perhaps for this reason the Department of Justice recommended that if carriers form data processing subsidiaries, transactions between subsidiary and regulated parent should be banned.¹⁴

C. Public Policy

The current status of any policy attending carrier diversification remains un-

¹³ Poindexter, *The New Growth at GT&E*, DUN'S REV., Nov. 1967, at 42. See also Response of General Tel. & Elec. Corp., FCC Computer Inquiry.

¹⁴ Response of the Department of Justice, FCC Computer Inquiry.

resolved. The FCC farmed out the responses to its computer inquiry to the Stanford Research Institute.¹⁵ That report was, to be charitable, somewhat ambivalent. On one side, SRI suggested that the economies of scale of carrier-owned computers might justify market-diversification into teleprocessing. On the other hand, the report took note of the competitive and innovative environment of the computer teleprocessing industry. Yet the report concluded that the Commission should consider postponing any decision and rely instead on the threat of treble damage suits as a short-term arbiter between regulated and nonregulated firms.

To the extent that the President's Task Force on Communications Policy took note of some of the salient economic characteristics of firms in the teleprocessing business, its recommendations were more direct.¹⁶ The report observed that remote computer services did not presently exhibit characteristics justifying comprehensive public utility regulation, and it found no convincing case for extending regulation to computer store and forward services.

Although these conclusions were welcomed by the data processing industry, the report is nevertheless not entirely free from ambiguity. Part of the problem is the proverbial search for a viable solution to Western Union's financial plight. The report observed that Western Union should be permitted to offer teleprocessing under the assumption that its record message service—the telegram—was hardly in a position to subsidize market entry.¹⁷ Perhaps this observation is valid, but the report apparently did not delve into the precedent value of that decision as it bears on other carriers, not to mention the issue of policy consistency.

The question then of whether carriers, telephone or telegraph, are to be permitted to move into nonregulated markets thus remains unanswered. Perhaps postponement of this question is, as the SRI report implies, the best of all possible worlds. Yet the line between postponement and procrastination is very thin. Delaying decisions on an admittedly tough and complex question increases the risk that corporate action rather than policy discretion will structure not only a new market but a new industry as well. The stakes are indeed high.

CONCLUSION

Both the interface and diversification questions have been treated as separate and unrelated issues. A second reading suggests a closer affinity—namely, the common theme of market entry. Recent modifications in the foreign attachment tariff, despite their controversial nature, do confer on the data subscriber an additional option or choice. Equipment ownership now means that the user may buy directly from a non-carrier equipment supplier on the open market. Stated differently, the nonintegrated

¹⁵ D. DUNN ET AL., STANFORD RESEARCH INSTITUTE RESEARCH REPORT PREPARED FOR THE FEDERAL COMMUNICATIONS COMMISSION (FCC Docket No. 16979, 1969). See also Professor Dunn's article in this symposium, p. 369.

¹⁶ PRESIDENT'S TASK FORCE ON COMMUNICATIONS POLICY, FINAL REPORT (1968).

¹⁷ *Id.*

or independent supplier has been given greater access to a new market—the data consumer.

Perhaps this step will stimulate pressure to extend that option to the operating telephone carriers themselves despite their affiliation with equipment manufacturers. Certainly computer firms supplying an array of digital switching equipment, concentrators, teleprinters, display units, modems, and the like, are finding themselves in the role of independent suppliers attempting to crack a closed, vertically-integrated market.¹⁸ The proliferation of competitive substitutes thus gives the computer industry more than passing interest in the structure and procurement practices of the common carriers.¹⁹

It is entirely possible that public policy will find itself coming full circle by addressing itself once again to the structure of the communication carrier industry as that structure bears on conduct and performance. In a very real sense, the questions of interface and diversification have subjected public policy to a profound reappraisal—a re-examination triggered by the interdependence of computers and communications that over the next decade will grow rather than recede.

¹⁸ *GE Introduces a Data Network*, N.Y. Times, June 12, 1969, at 65, col. 5; *GE Steps on Teletype's Toes*, BUSINESS WEEK, April 5, 1969, at 52; *IBM Phone Calls Europe*, BUSINESS WEEK, April 19, 1969, at 39.

¹⁹ FCC, PROPOSED REPORT, TELEPHONE INVESTIGATION (1938). Competitive bidding, requested in this report, was dropped a year later.