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MAJOR ECONOMIC ISSUES IN
DATA PROCESSING/DATA COMMUNICATIONS SERVICES



Horace J. De Podwin Associates, Inc.

**MAJOR ECONOMIC ISSUES IN
DATA PROCESSING/DATA COMMUNICATIONS SERVICES**

Prepared for
Business Equipment Manufacturers Association
Submission to the
Federal Communications Commission
Docket No. 16979

February 1968

Horace J. De Podwin Associates, Inc.

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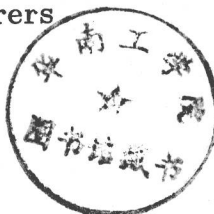
Horace J. De Podwin Associates Inc.

ECONOMIC AND MARKETING STUDIES

10 East 40th Street, New York, N.Y. 10016

February 23, 1968

Mr. Harry Anderson, President
Business Equipment Manufacturers
Association
235 East 42nd Street
New York, New York 10017



Dear Mr. Anderson:

Transmitted herewith are the results of the study, Major Economic Issues in Data Processing/Data Communications Services, which the Business Equipment Manufacturers Association commissioned this organization to undertake.

The study was designed to identify the economic issues in the public market for data processing services insofar as they bear on the question of regulation as raised in the Federal Communications Commission's Notice of Inquiry (Docket No. 16979).

In the course of this work, we obtained essential data and insights from experts in the data processing field. Among these were the directors and staffs of computer centers and communications departments at the following organizations: Carnegie-Mellon University, Kiewit Computation Center at Dartmouth University, Project MAC at Massachusetts Institute of Technology, Rutgers-The State University, University of Washington, American Telephone and Telegraph Company, Bunker-Ramo Corporation, IBM, New York Central Railroad, New York Telephone Company, Systems Development Corporation, UNIVAC Division of Sperry Rand Corporation, Western Union Telegraph Company, Westinghouse Electric Corporation.



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We benefitted greatly from discussions with many economists and technical experts. Special thanks are given to Thomas Z. Corless, Director, Communications Industries Division, U.S. Department of Commerce; Nelson Hanover, Massachusetts Institute of Technology; Manley Irwin, Whittemore School of Business and Economics, University of New Hampshire; Andrew A. Horner, Director, Program Management, Transportation and Communications Service, General Services Administration, United States Government; Thomas C. O' Sullivan, Space and Information Systems Division, Raytheon Company; Abe Rothman, Director of Statistical Services, U.S. Department of the Interior; Michael M. Gold, Assistant Director, Computation Center, Carnegie-Mellon University; economic staff, Common Carrier Bureau, Federal Communications Commission; computer specialists, National Bureau of Standards, U.S. Department of Commerce.

Numerous service bureaus were interviewed. Those providing descriptions of and statistics on operations included: Applied Logic, Automatic Data Processing, Inc., C-E-I-R, Inc., Dial Data, Keydata Corporation, Law Research Service Inc., Management Information Systems, Inc., Opoc Computing, Inc.

We also wish to thank the Business Equipment Manufacturers Association staff and the ad hoc committee of the Data Processing Group for their cooperation and assistance. The findings and conclusions, however, are solely our responsibility.

As you have requested, biographical sketches of those who worked on the report directly are contained in the statement appended.

Sincerely,

A handwritten signature in dark ink, reading "Horace J. De Podwin". The signature is fluid and cursive, with the first name "Horace" and last name "De Podwin" clearly legible.

Horace J. De Podwin, President
Horace J. De Podwin Associates, Inc.

Research Team

MAJOR ECONOMIC ISSUES IN DATA PROCESSING/DATA COMMUNICATIONS SERVICES

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CHAPTER I: MAJOR ECONOMIC ISSUES IN THE FCC'S INQUIRY INTO DATA PROCESSING AND DATA COMMUNICATIONS

The use of common carrier communications facilities to transmit data is becoming more prevalent. The intersection of the data processing and the communications industries has led the Federal Communications Commission to seek information with which to evaluate the regulatory and policy questions inherent in this interrelationship.¹ This study was undertaken to serve the purposes of the Commission's inquiry by examining the principal economic characteristics of data processing/data communications services and focusing attention on this question: Is a public utility type of regulation required to ensure that the public realizes the benefits available in this service? Or, alternatively, will maximum benefits be derived by allowing the service to develop within the context of a freely competitive environment?

It is generally agreed that necessary services can be provided to the most people at the lowest cost in a competitive market. In certain sectors of the economy, however, the benefits normally resulting from competition may not be realized by consumers; and, hence, "the widespread use of an essential service" may be prevented.² This might occur because the structure and operation of the industry do not allow firms to reach optimum size (minimum cost). When several companies operate in an area and compete vigorously and successfully with one another in the sale of an essential service, prices might include no profit or a very small one. Given the industry structure, however, prices are higher than they would be if only one company, much larger in size than existing firms, were operating

with normal profits. The government might be justified in intervening to ensure that the service is produced and distributed under conditions which maximize inherent economies of scale--that the firm be allowed to reach optimum size and be required to pass on cost savings to the public.

The second reason for intervention arises when a firm (or group of firms) of optimum size dominates the market for an essential service but does not pass on to consumers its benefits over the long run. The dominant suppliers might acquire their position through (a) a monopoly on production or distribution facilities, (b) very high capital requirements for entering the industry, or (c) regional and specialized nature of demand.

Our economic analysis of the market for data processing/data communications services indicates that none of these conditions prevails. The processing of data is characterized by free and open entry with no tendencies toward centralization and control by a few firms. Moreover, the nature of demand is not such that decreasing costs could be realized through standardization.

SUMMARY OF THE RELEVANT MARKET FACTORS

In our analysis, we have considered the public market for data processing/data communications services. The study begins with an examination of the industry that supplies data processing services in order to determine the extent of competition. Once the product scope and current structure of industry are defined, the characteristics of market entry and market growth are looked at to project the degree of competition that is likely to be extant in the future. The findings regarding the supply of data processing services indicate:

- During the last fifteen years of the unregulated industry's provision of data processing services, there has been a growing number of suppliers competing among themselves vigorously.
- There are virtually no barriers to continued entry of new firms in this industry, so that competition should continue to be vigorous in the foreseeable future.

The second step in the market analysis was to study the demand for data processing services including the volume of demand, the type of services being requested, and the users of these services. These aspects of demand required examination of the large variety of computer and supporting equipment produced by the manufacturing side of the data processing industry. Here we found no indication that regulation will be required to insure the widespread use of data processing services:

- High rate of technological innovation has been geared to the needs of data processing users.
- Applications are highly individualized and present few opportunities for standardization.

Next, is a study of the areas of future applications and how they will be met. We found that:

- Although data transmission is still a small part of all data processing services, it is projected as integral to the fastest growing areas of applications.
- Coordination of data processing and data communications services, rather than extension of regulation to data processing, can best assure the least costly, most widespread, and most efficient use of both services.

Significant to the projection of future use is the structure of and trend in total costs for data processing/data communications services. Costs of the components of these services; i. e., equipment, manpower, and communications, were studied to determine whether there exist cost savings that can be realized only from large scale production centralized in regionally (or otherwise) non-competitive firms. Our findings were that no such economies of scale exist:

- Given the limitations of peripheral equipment and control programs, there appear to be no significant advantages in installing very large systems to serve a multitude of people or applications.
- Wages and salaries are a high proportion of total costs and, with the exception of a few specialized services that sell raw computing time only, show little if any tendency to decline as the scale of operations expands.
- Common carrier charges for communications facilities constitute an external economy. They are not controlled by management as are equipment and manpower and do not vary with the scale of operations but with external factors.

Finally, the authors have reviewed the present activity and stated future intentions of communications common carriers in the provision of data processing services. A common carrier providing a data communications service with data processing capabilities, such as SICOM and INFO-COM Services, could reduce, if not eliminate, effective competition:

- Monopoly position in communications gives common carriers advantages of priority and cost allocation which competitors could not match.

- If the common carriers are allowed to provide data processing services, they should be required to do so only through separate subsidiaries. Communications facilities and other services and equipment should be transferred between parent and subsidiary at established tariff rates.

Whether communications common carriers should be permitted to provide data and information services depends upon the Commission's being able to establish a basis for allowing common carrier participation (a) without undue anti-competitive impact and (b) without impairment of basic communications services.

FOOTNOTES: CHAPTER 1

1

Federal Communications Commission, Docket No. 16979,
Notice of Inquiry, November 9, 1966, p. 7.

2

James C. Bonbright, Principals of Public Utility Rates,
New York, Columbia University Press, 1961, p. 9.

CHAPTER II: INDUSTRY STRUCTURE AND GROWTH

The electronic computer and the array of equipment and services developed to facilitate and extend its use constitute one of the century's truly great innovations. Entirely new industries have evolved from the original technology, and a vast array of applications is just beginning to emerge. Industry developments "during the past two decades have yielded a computing technology with present capabilities that would have staggered the imagination of early pioneers in this field only twenty years ago."¹ The amount of raw computing power in the United States has been doubling every year,² and there are well founded expectations that it will continue to increase at this rate throughout the next decade. At the same time, the cost of information processing has dropped dramatically, and the application of computer systems has done much to accelerate "the overall pace of technological change,"³ in the economy.

The President's Science Advisory Committee reporting on Computers in Higher Education concluded, "Computers and computing are simultaneously an American resource and a challenge to America."⁴ Thousands of people and vast amounts of resources are involved in the production and use of data processing. It has been one of the fastest growing industries in the United States. As more people use data processing systems and as systems extend beyond an individual site, many sectors of the economy other than the data processing industry itself are affected. Production and services of all contributing sectors

must be encouraged to best insure that the pace of technological innovation continues uninhibited. Only in this way will the full benefits of widespread use at the lowest possible cost be insured.

PRODUCT SCOPE

The product of the data processing industry is a service, that of processing information. Users can provide the service for themselves by having their own data processing systems installed. The system then is a tool applied to the user's operations as he decides. In this, it is similar to machine tools which are integrated into a production process by the user. Data processing systems are usually more complex than machine tools both in design and in application. For both machine tools and data processing, however, it is the user not the manufacturer who determines how, when, where, and if the tool shall be used. Such data processing systems may or may not use data communications.

Even when common carrier services are used, this constitutes the private use of a facilitating service. This should have no economic effect on the public at large and, therefore, should require no regulation in the public interest.

The user's alternative is to purchase data processing requirements from an external source. This source may be:

- One of many organizations that have available capacity on their internal systems, and thus sell computer time. Among these organizations are banks, firms in the aerospace industry, and educational institutions;
- Manufacturers of data processing equipment offering either computer time or a data processing service on their own systems; or

- One of the many organizations that have been established specifically to provide a data processing service.

These organizations are called service bureaus or service centers.

They produce a major and rapidly growing share of the supply of data processing services. The user has a choice among the different types of services provided by these bureaus depending upon the skills he has and the needs of his organization. Some bureaus provide a complete processing service where the customer delivers his raw data, sometimes keypunched into cards or paper tape but often not. He receives finished output from the bureau; e. g., listings, reports, checks, analyses. These firms are particularly attractive to small and medium sized business enterprises since they have to know virtually nothing about data system operations. The typical skill required is that of a typist on a keypunch machine or an input-output terminal.

Other service bureaus provide computer time only. The user is responsible for all programming and operation of the data processing equipment. This method is suitable particularly for large organizations which have their own in-house systems and need additional time since they usually can afford to maintain their own programming staff. Other users of this type of service are scientific and engineering concerns whose personnel acquire programming capabilities as part of their work.

The largest proportion of processing by all types of service centers is batch processing. The data or information is collected and then processed as one mass. In most cases, the data are sent to the bureau by truck, mail, or messenger. Although most of this segment of the industry does not now

use communications facilities provided by the common carrier, there is a possibility that they will desire to do so in the future. Since the availability and cost of common carrier facilities will be one determining factor in their decision, this large segment of the industry is of equal concern to the FCC inquiry.

Some data processing service bureaus already are equipped for communications services. The customer sends the data by communications wire to the bureau, where it may be accumulated and processed in batch. This is appropriate for users who have the same kind of data processed on a regular basis. Payroll and inventory are two common applications. Many of the bureaus offering off-line batch processing service have been providing a similar processing service for a number of years. The installation of an electronic computer represented advanced technology to perform the same job.

For users requiring faster processing and response, there are service bureaus that provide real-time on-line services. These are by far the minority of bureaus. Users have communications terminals on their own premises through which they send data to the computing center. Their material is not accumulated, but usually goes directly into the computer. There it is processed and a reply sent out virtually with no delay. About twenty of these bureaus offer time-sharing services. Here the computer processes the data of two or more users simultaneously but with such speed that it gives each user the appearance of processing his data alone.

The necessary ingredients for providing data processing/data communications services are data processing equipment, communications facilities, and manpower.

Equipment (Hardware)

The configuration of one service bureau's data processing system is shown in the chart below.⁵ The main central processing unit, located in Los Angeles, is connected by common carrier communication links and data sets to remote user sites. Significant in this configuration are the large amount and variety of equipment required to support a central processing unit in a modern data processing/data communications system. Indeed, the central processing unit in this system represents less than half of the equipment value--from 40 to 50 percent.⁶

Peripheral equipment shown at the main location includes a six-million word magnetic drum storage system, eight magnetic tape drives, a high-speed plotter for curves and charts, printers, and cardpunch and reader devices. The console is a card processor for direct input into the machine. A similar card processor is located in Houston; hence, providing the user at a remote location with the same data processing capabilities that he would have at the main site.⁷

Although the central processing unit is often a computer, it need not be. It may be a less complicated, but widely used non-computer processing unit such as punchcard and tabulating machines, automated bookkeeping machines, and electronic calculators. These simple data processing machines are used either alone or in support of computer systems, and even these relatively uncomplicated machines may be used with data communications. Such systems are not as sophisticated or as glamorous as the on-line computer data processing systems, but they do perform an essential function for the small business which cannot afford to own or does not choose to use a computer system.