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MAKING USE OF REMOTE COMPUTING SERVICES

"Where are your CPU cycles most likely to come from in the next five years—from in-house computer centers, from distributed mini-computers, or from outside remote computing services?" That is the question we asked the data processing executives in a number of organizations. What we were after was the likely role of remote computing services (RCS) in the next five years or so. We wondered whether, with the growing use of mini-computers, the market for RCS might not be significantly reduced. The answer we found seems to be both Yes and No. Yes, in-house systems will be taking over a number of applications currently on RCS. But No, the overall RCS market will not dry up. In fact, it apparently will grow faster than the computer field as a whole. It is this apparent paradox that we discuss in this report.

The Johns-Manville Corporation, with a spectacular new headquarters building near Denver, Colorado, is a widely diversified manufacturing company. Product lines include building materials, fiber glass, industrial and pipe products, asbestos fiber, lighting products, and others. The company has over 90 plants and mines in the U.S., Canada, and internationally. Annual sales exceed $1.3 billion and the company employs about 24,000 people.

We talked to representatives of a number of the Johns-Manville divisions about their current and expected future uses of remote computing services. Extensive use is being made of RCS and this use is expected to continue. In addition, the company has a longer term goal of installing its own interactive services network. Currently, it has a batch-oriented network connected to its major plants. When an interactive network is installed, it is expected that many of the RCS applications will be transferred in-house. In the meantime, the use of outside RCS provides the quickest, easiest way to install many new applications.

The pipe division, which produces asbestos-cement pipe, began using the General Electric Mark III service in 1973. The application involved production reporting at six plants, all making much the same products. The first phase of the application was to produce the reports faster and in a more standard format. Division management liked the results and so another five plants were added to the system during 1974. Also during that year, the system was enhanced. Both the plants and division headquarters could access data stored in the RCS central files. Performance projection capability was added. It was followed by an order receipt system and an asbestos fiber inventory and usage tracking system. The division has been so pleased with the results that much the same type of system is now being developed for those plants that produce PVC (plastic) pipe.

The marketing department of the building materials manufacturing division may be the largest user of RCS within Johns-Manville. The department started using the Service Bureau Corporation's services when Johns-Manville headquarters were moved to Denver in 1971. Currently, about 300 jobs are performed monthly for this de-

partment, using both the in-house remote batch system and SBC. In one application, sales data flows to Denver via the corporate batch network and then selected data is transferred to the SBC system. It is used to prepare financial summary reports and projections for each plant and warehouse on a daily basis. The system keeps marketing management much more up-to-date on what is happening than does the regular month-end financial reporting system. Several other fast response applications serve division management, sales managers, finance managers, etc., mostly using programs developed by Johns-Manville but in a few cases using SBC proprietary programs.

The production department of the building materials manufacturing division was an early user of the GE time-sharing service in the company. As one example of this department's use, quality control data is entered daily at the division's plants and is then analyzed regularly by quality control people at division headquarters. Another example is a fast response inventory control system for several plants which provides the status of work-in-process and finished goods inventories and also provides the ability to shift production among plants for load levelling.

One interesting advantage of using an RCS was pointed out to us by this department. Most of the programs used in these applications have been developed by the staff at headquarters, using the RCS. During the development of a new application, as the first sample outputs become available, they are printed out in the plants and reviewed by the operating people. These people call Denver, discuss the reports, and ask for changes. After the changes have been made, the revised reports are printed out at the plants. The process continues through several iterations, until the reports meet the desires of the users.

In the fiber glass manufacturing division, industrial engineers began encouraging the use of time-sharing in 1969 to improve plant reporting, via an eastern RCS. The applications were moved to the CSC Infonet service in 1973. The industrial engineers in the fiber glass division encourage plant people to do their own programming, generally in Basic, for possible eventual conversion to in-house mini-computers.

International uses

The lighting (Holophane) division uses remote computing services as sales aids for sales representatives in the U.S., Canada, U.K., and other countries. These sales representatives call on architects, engineers, and others in the construction fields in the various countries. The RCS are used for performing illumination calculations, cost analyses, return on investment analyses, and so on. These applications were initially set up on a New York service. With the move to Denver, the applications were switched first to one Denver RCS and then to Computer Sharing Services in Denver. The applications are now being converted to run on the GE service also, to provide the same capabilities in Europe, the Middle East, and Africa.

The marketing department of the international products division deals with 61 shipping locations in the U.S. and Canada. The department uses the GE service for three applications—order writing and order status for shipments to international customers plus a customer record application. More information is needed about each international customer than is needed for domestic customers, such as required documentation, payment regulations, customs regulations, and so on. The GE service has allowed Johns-Manville to handle international customers without having to modify the domestic order writing and order

The company contacted with GE to develop an accounting system for the European subsidiaries. Currently, data is collected on Datapoint terminals in London and Paris, and is transmitted weekly and at end of month. Eventually, the system is expected to be extended to Belgium, Italy, Spain, and West Germany. The international division is also considering using these terminals for a European order entry system. If the expected benefits do in fact accrue, then the system might well proliferate throughout Europe.

In 1974, the Canadian products division asked for a complete inventory management system covering all Canadian plants and warehouses. Previously, the division had been using some stand-alone analysis programs but management wanted an integrated system. The GE service was chosen because of the ease of getting the application running and because of the wide coverage of the network. The system uses off-line data entry, capturing data on cassettes. The data is then transmitted to the GE computers late each day and reports are back the next morning; some functions are handled on a few-hour turnaround.

This system was first installed in 1975 and during the next year was extended to ten locations. Usage grew rapidly and so did costs. After a study, the Canadian products division decided to bring the application in-house in order to reduce costs. A data center was set up in Toronto, in part justified for this use and using an IBM 370/115. The turnaround schedule is about the same as the company chose to use with the GE service.

The role of corporate data processing

The Johns-Manville data center in Denver uses an IBM 370/158. Smaller models of the 370 are installed in five other centers in the U.S. and Canada. There are also a number of smaller systems, such as the IBM System 3, and some 70 intelligent terminals (primarily Datapoints) throughout the company. As we mentioned, the company has a batch-oriented data communications network in operation.

Data processing management at headquarters began the active monitoring of RCS usage in 1973. At that time, the company was using 13 RCS vendors. After reviewing the use, consolidations were suggested. There are now just five RCS vendors used. In addition, the data processing staff has encouraged the standardization of terminals by the various RCS users, in order to provide a standard interface as new applications are developed.

The use of the batch network has grown rapidly, with more than a five-fold increase in the hours of use occurring during 1976. The remote job entry capability offered with this network has provided an alternative to the use of outside RCS. Users are charged for usage but at a lower rate than for equivalent outside services.

The company hopes to install an in-house interactive network in the future, as another alternative to the use of RCS. But, data processing management recognizes, it would have to be cost-effective and provide services as quickly and easily as the outside services provide.

In the meantime, the company expects to continue making rather extensive use of outside RCS to supplement in-house data processing.

Stanford Research Institute

Stanford Research Institute is an independent, non-profit problem-solving organization that performs basic and applied research under contract for clients in business, industry and government, in the U.S. and 65 other countries. Headquarters are in Menlo Park, California, just south of San Francisco. The Institute employs about 3,000 people, nearly two-thirds of whom are professionals representing over 100 disciplines. A CDC 6400 and a Burroughs B6700 are installed in a computer center for serving the administrative, financial, and general user population.

About 600 SRI employees are involved with the use of computers in some way—research, analysis studies, developing computer-based systems for clients, and so on. These people thus generate many demands for computer capabilities. To control the use of computers, management has set up a computer review board which approves the purchase and rental of new computers.

In 1976, this computer review board observed that a number of things were happening that needed investigation. The board was getting numerous requests for procuring mini-computers, for "work that cannot be done properly on the central computers." In addition, many of the staff were using outside RCS and overall computer use was growing at a fast rate. That being the case, said the board, what were the long range plans for the overall computing services at SRI? Where do the central computers fit into this plan? What is the obsolescence factor for central computers in the SRI environment?

To develop answers for these questions, the board set out to investigate the growth in computer use, determine the magnitude of the control problem, and recommend a course of action.

SRI found that, in addition to the two central computers, there were 55 mini-computers in use throughout SRI facilities. These ranged in size from an IBM 5100 to a DECsystem-10, the latter being a powerful medium size system. Many of the minis were initially used for specific purposes—but soon began to take on general purpose functions. In some instances, initial data handling was being performed on a mini and the data was then turned over to the computer center.

SRI also found that many users of minis wanted to tie them into a network. When a job or problem was too big or unsuited for the mini, it could be sent over the network to a computer where it could be solved.

SRI found, too, that the SRI staff was making consistent use of outside RCS. However, there was inadequate information available on just who was

using each service and for what reasons. Better information would be needed for planning and monitoring this use.

It was concluded that the use of minis and RCS changes the load on the central computing facility. Further, SRI felt that it was just not feasible to try to prevent the use of minis and RCS. Users would either find a way around any constraining policy or would just beat it down with logic.

The main recommendation of the study was the following. Recognize that the central computer facility cannot provide all of the computer services needed by SRI. The use of mini-computers and RCS will not only continue, it will grow. A network of computing services is needed, with the central facility being just one member of that network. SRI should plan for this network, then determine how best to use that network, and also make sure that the SRI internal network interfaces efficiently with the outside services that are likely to be used.

Del E. Webb Corporation

The Del E. Webb Corporation, with headquarters in Phoenix, Arizona, is a real estate developer and operator (Sun City, Arizona), resort hotel owner and operator (in Las Vegas, Reno, and Lake Tahoe, Nevada), and general contractor. Annual sales are in the order of $300 million and the company employs about 9,000 people.

Prior to 1975, the company had IBM System 3s installed at the three main hotel locations in Nevada. Then management decided to centralize the data processing function in Phoenix. Four Phase terminals were installed at the remote hotel locations, for data entry. Data is captured at the terminals and transmitted to Phoenix in an off-line mode, from Four Phase to Four Phase, for processing on the corporate Burroughs B4700 computer. At Sun City, Arizona, CMC equipment is used for data entry and then transmitted to the Four Phase equipment at the data center.

The company has been installing other mini-computer systems in its multiple operations. A Basic Four system has been installed in the company's travel service for handling reservations, monitoring charter flights, and so on. A hotel front desk turnkey system, developed by Sigma Data Computing Corp. of Rockville, Maryland, has been installed in a Las Vegas hotel.

The company recently set up a credit union for its employees. To help get this activity started, data processing services are purchased from Access Data Systems in Phoenix, which provides batch and remote batch services. Eventually, this application may be brought in-house.

At one time, the company used the GE service for a financial analysis application. But this application was brought in-house when a capital investment system was developed.

While the Del Webb Corporation makes no current use of interactive RCS, it has used it in the past. Moreover, if a user within the company has a special need and if an RCS can solve that need, then the use of a RCS will be seriously considered.

The role of remote computing services

These case examples illustrate the wide range of uses that are being made of remote computing services. Where extensive use is being made of RCS, the companies are investigating how at least some of that use might be brought in-house, in order to reduce costs.

The in-house versus RCS decision is really the familiar make-or-buy decision. As in any make-or-buy decision, a few factors dominate the decision. One is volume; a low volume favors buying and a large volume favors making. Another factor is the difficulty of making the product or service in-house. The purchased product or service may be protected by patent, copyright, or trade secret, or may be sufficiently complex to discourage developing an in-house capability. Other factors include the ease or difficulty of keeping the in-house product or service competitive, in terms of cost and service.

But distributed and decentralized systems, making extensive use of mini-computers, appear to be a threat to commercial RCS. Instead of using an RCS, the user may choose to transfer the application to an in-house mini-computer. We wondered what the future might hold for the commercial RCS and began asking opinions of people we know who are familiar with this field. It was an interesting question, they said—and they did not know the answer. So we started to dig more deeply into the subject. This report is the result of our study.

In a sense, there is quite a similarity between RCS and distributed systems. Both aim at putting *control* of the processing into the hands of the end

user. Perhaps the location of the processors and data storage is less important than who controls the use of the processors and the data.

At least, from the end user's point of view, the physical location of the processors and data storage may not be highly important. Assuming that either a distributed system or an RCS provide adequate security and privacy (and that is a big if), then the decision between them will be influenced by the economics. At present, processing and storage costs are falling more rapidly than are communication costs. This fact favors the choice of distributed systems over the use of RCS, provided that the user can get equivalent service from either.

If the economic trends seem to favor the in-house solution, what will the RCS have to offer to counteract these trends? Stefferud (Reference 1) gives a lead to the answer. Of the four main cost factors—hardware, software, communications, and labor—only the labor costs are increasing per unit of volume. Economies of scale in all of these are important; with larger centers, less labor is needed per unit of volume. The economies of scale from all four factors can be passed on to the end user. Moreover, the RCS might provide specialized services so efficiently that in-house systems would have a hard time competing. (An example of this is the payroll service offered to 30,000 firms and 400 banks by Automatic Data Processing, Inc.) In addition, says Stefferud, it is often the case that the use of one service promotes the use of other related services. Finally, he says, it should be recognized that the RCS market has an elastic demand. As prices fall, total revenues increase because increased demand more than makes up for the lower prices.

What will be the consequences of these economic factors? Stefferud sees RCS networks allowing the pooling of specialty resources and the shared use of these resources. Such networks will offer far more than it is possible to do on a small computer. Networks will grow because of economies and breadth of services and this fact will encourage more and more services to be offered via the networks. It just will not be economically feasible to perform all of these functions on small in-house computers. The "transportation system" (the network) will allow production to be separated from consumption, says Stefferud, so that there will be a shift away from the cottage industry environment to the mass production environment.

So Stefferud sees the growth, not the demise, of services provided over a network—as are done by the remote computing services.

What is happening?

If Stefferud's analysis is right, there ought to be some hard evidence to support it. Here is what we found.

What the suppliers are doing. We read a number of articles and papers in our research on this subject, some of which have been referenced at the end of this report. We saw numerous figures on the size of the RCS market and its rate of growth in the U.S. There was no consensus on market size, with estimates differing by a factor of three, perhaps due to differences in the definitions used. On the other hand, there was fairly good agreement on the rate of growth. Expenditures for products and services in the computer field as a whole are increasing at roughly 10% to 15% a year, we gather. Remote computer services as a whole are increasing about 20% per year—and particular portions of RCS are growing at over 30% per year!

Rothenbuecher (Reference 2d) points out that of the top 50 companies in the data processing industry, the following nine have a significant amount of service business: CDC, GE, CSC, McDonnell-Douglas, ADP Inc., Xerox, GTE, Tymshare, and Boeing. All are doing at least $50 million a year in services business. And in 1979, IBM will be free to once again enter the services business, according to the terms of the CDC suit settlement.

GE's huge Mark III network service extends from Europe to the Far East, covering some 16 time zones. Revenues are estimated at about $150 million a year. Other commercial RCS are also offering services over widespread private networks.

As a parallel development, the U.S. now has two public networks over which computer services can be delivered—Telenet and Tymnet. The latter originated as the private network of Tymshare, Inc. and in 1976 became a regulated common carrier. Both offer users access to a variety of computer-based services.

EDP Industry Report (Reference 3) reports that about half of outside services currently are batch

services. Remote batch and interactive services make up the remainder, with the latter dominating. Of the interactive services, almost one-half provide raw computing power (conventional time-sharing services), another one-third are transaction processing services, and the remainder are data base query services. Raw power is most vulnerable to being moved in-house and hence will not grow as fast as other segments of RCS. Batch services, too, will not grow as fast. Growth will occur in remote batch and interactive services for transaction processing and data base queries.

Pantages (Reference 2c) has documented the growth of Automatic Data Processing, Inc. Not as well known as some of the other service companies, ADP's revenues are getting close to $200 million per year. It is performing about 10% of the total batch processing services in the U.S. and, as we mentioned earlier, does the payroll services for some 30,000 firms and 400 banks. But ADP is moving aggressively into the RCS field. It is offering specialized on-line services and remote batch services for auto dealers, stock brokers, and others; these include on-line order entry and inventory control. The company acquired Cyphernetics in the U.S. and Delos International Group in the U.K., both time-sharing companies. ADP has developed and sold mini-based turnkey systems, and also offers on-line services to the same systems located in their data centers (of which they have 35).

Datapro Research Corporation (Reference 4), in reviewing the trends in the field, sees the following happening. Several large nationwide suppliers of RCS will emerge, offering a broad range of computing, information retrieval, and communications services. These suppliers will offer an ever growing variety of packaged applications. The smaller RCS companies will survive by offering highly specialized services. At the same time, users will make increasing use of in-house time-sharing and small business computers.

What the users are doing. We found evidence that users are moving both toward more use of small business computers and to more use of RCS. As an example, at one Johns-Manville plant, an enhanced Datapoint 2200 "terminal" has taken over a number of functions formerly performed on the GE network. It is really more than a terminal, it is a small business computer. It has a 16K memory, 40 million bytes of disk storage, 125 line per minute printer, and is tied to production recorders in the plant. It produces all local reports—but transmits selected data to central files by way of the GE network. As we indicated earlier, Johns-Manville has put a variety of applications on RCS networks in the past few years—at the same time that they have been moving toward intelligent terminals and small business computers that take over some of the RCS functions.

McLaughlin (Reference 2b) has described the characteristics of the 1976 data processing budgets of some 270 firms. Two points stand out as germane to this discussion. One point is that the overall DP budget for most of the organizations represents less than 1½% of the gross revenues of those organizations. Data processing thus might be considered as "a noise level expense that is probably less than the phone bill for an average company," says McLaughlin. (While we agree that data processing costs constitute a very small percentage of overall budgets, on the average, we do not agree that they are "noise level" expenditures. The central nervous system of the human body represents only a small percentage of the total weight of the body, but its importance to the functioning of the body is critical.) The second point that stands out in McLaughlin's article, germane to this discussion, is that the expenditures for outside services (batch, remote batch, and time-sharing) is less than 1% of the overall DP budgets, in most of the organizations surveyed. Seldom did the average expenditure for these outside services reach 2% of the DP budget. Moreover, these expenditures for outside services were reasonably similar (as a percent of total budget) over a wide range of organization size.

Datapro Research Corporation (Reference 4) found the following in their survey of some 475 user organizations. Of these firms, 28% had monthly expenditures of less than $500 per month for outside services, 34% spent between $500 and $2,000, 17% spent between $2,000 and $5,000, and the remaining 21% spent over $5,000 per month.

What can be concluded on the role of RCS?

If the overall DP budget is truly a "noise level expense," as McLaughlin sees it, then the budget

for outside services would have to be classified as only a tiny wiggle in the noise—about 1/10,000 of an organization's total budget. The magnitude of the outside service expenditure certainly would not draw much attention from top management.

At the same time, nine of the top 50 companies in the data processing field are quite heavily into the services business, with revenues exceeding $50 million per year each. So all of these companies are obtaining their service revenues from that small percentage of DP budgets allocated to outside services.

The use of RCS could then grow markedly in the years ahead without becoming "large" as a budget item for the average user. It seems to us that commercial RCS firms have plenty of room in which to grow.

This does not mean that there will not be a growth in the alternatives to the use of RCS. The RCS firms will have to scramble for their increases in revenue. They will do this by helping companies install distributed systems, by offering superior and/or specialized services, and by reducing their prices based on advances in technology.

But it certainly appears that RCS will play a *supplementary* role to in-house data processing, for most organizations. Users will buy RCS offerings where it is cost-effective to do so. We do not see the RCS firms becoming the "computer utilities" that were forecast a few years ago—at least, not in the foreseeable future.

As mentioned earlier in this report, some RCS services (transaction processing and data base query services) appear to be growing 30% or more per year, as compared with an average growth of expenditures in data processing of about 10% to 15%. *If* this rate of growth were to continue, how long would it take before RCS services accounted for, say, 25% of the data processing budget of the average firm. Since the RCS services would grow 15% to 20% per year faster than the other expenditures and since they now appear to represent about 1% of the average budget, it would take at least 17 years of sustained growth to reach 25% of the overall DP budget.

It is not at all clear that RCS *can* sustain that rate of growth for such a time period. If it does happen, it will be because the RCS networks become very broad marketplaces for computer-based services, as Stefferud has described. As we have pointed out, there is evidence that the RCS networks *are* developing in this fashion, so it is possible that outside services will be playing a much larger role 10 to 15 years from now (but less than 25% of DP budgets, we would think).

But in the meantime, RCS will play only a supplementary role for most computer-using organizations. Let us next consider some of the pros and cons about RCS offerings that data processing management will want to take into account in deciding on these services. Then we will consider how expenditures for outside services might be controlled. Even though these expenditures are small in relation to DP budgets, users have found that they still must pay attention to them—and this is not always easy.

The pros and cons of RCS

A number of the following points came up over and over again during our discussions with RCS users and in the literature. Datapro (Reference 4), Carter (Reference 5) and Info-Dyne (Reference 7) provide summaries based on surveys of RCS users—Datapro and Info-Dyne in the U.S. and Canada, and Carter in the U.K.

Advantages of RCS

Commercial RCS firms employ professional staffs that are charged with keeping the services near the forefront of the technology. In-house systems tend to become technologically obsolete unless they are continually updated. The RCS firms, because of competition, have to stay up to date.

The commercial RCS firms also are continually developing a growing library of application systems and packages. These systems and packages are taking on more of the characteristics of common systems, which we discussed in the January and April 1977 reports. Where common systems fit a user's needs, conversion to them has proved to be quite easy.

Where common systems do not exist or do not fit the user's needs, the RCS firms employ an experienced field staff to help users develop their own tailor-made systems. This field staff generally is available when the user is willing to pay for the services. An in-house development staff is often assigned on a priority basis over which a user department may have little control.

An RCS firm offers the advantages of advanced technology, such as efficient data commu-

nications and powerful data base management. Usually, a range of turnaround times is offered, with higher charges made for the more rapid turnaround.

Competition among the RCS firms means that price reductions due to improved hardware/software/ communications are passed along to the users. Where economy of scale exists, it too can provide price benefits to the users. Further, RCS firms tend to offer interactive, remote batch, and batch services, so a user can select the most economical mode of processing that will fit the needs for each application.

Use of RCS means that the user avoids large, early investments in hardware. Present value analysis thus tends to favor the use of RCS because an in-house system ties up more money for longer periods of time. Similarly, users can buy only as much capacity as is needed, when using RCS, while "extra capacity for growing into" usually is obtained (at extra cost) for in-house systems.

Use of RCS means that the user firm can delay making a commitment to new equipment during a period of rapid technological change. For instance, at the present time there is rapid change and price reductions in small business computers and in data communications services. Users putting in distributed systems may choose to use RCS for one or two years to wait for some expected improvements and price reductions, before committing heavily in equipment.

By using an RCS, a user may avoid or at least reduce the data processing operating problems. These problems can include staffing a multi-shift computer center, running a complex data communications network, updating an operating system with the latest releases, and so on. An RCS generally provides multiple computers for load sharing and backup.

Using an RCS allows the user to set up a new application system and get it running smoothly, concentrating mainly on the application system rather than on data base management, data communications, etc. After the system is running smoothly, it can be transferred in-house, if such a move would be cost-effective.

By installing a new application system on an RCS initially, the user can reduce the risk of making a poor choice of equipment. Equipment for the in-house system can be selected after the system is running on the RCS.

RCS networks provide marketplaces for value added services. A whole series of sequential services might be obtained via such a network. For instance, one service might be text editing, for the authoring of narrative text; text editing allows for the easy insertion, deletion, and change of textual material. Another service might be image or graphical processing for, say, the development of line drawings to go along with the text. Another service might be that of photocomposition which produces camera-ready copy from the combination of the text and graphical data, ready for printing.

Stefferud has written at some length on the concept of "retail/wholesale" services that can be provided via networks. As an example of this concept, a retail service bureau might have only input and output terminals for its hardware and buy all of its CPU cycles and data storage from a wholesale supplier. (As a matter of fact, we used such a retail service bureau for several years, for some of our data processing.) As another example, the date processing department of a company might act as the retailer, buying bulk services from wholesalers and reselling them to departments within the company.

In a private communication to us, Stefferud stressed two points. One, the idea of buying bulk services and reselling them is a "new game." It is a new, somewhat foreign idea in data processing: DP people are not accustomed to think this way. So it may take some time to develop staff members who can be effective in this environment. Secondly, the term "retail/wholesale" may give the wrong impression. Actually, there can be a long chain of wholesalers, one serving the next, before the retail level is reached.

Finally, an RCS can provide a more complete data processing service to a user site than can, say, a limited capability small business computer. A small business computer might be used for repetitive, local processing—but this computer then calls on network services for functions beyond its capabilities.

Shortcomings of RCS

When using an RCS, the user does not have extra capacity available at little or no extra cost. The user is charged for all time during which the terminal is connected to the RCS, as well as for all resources used. With an in-house computer, there

generally is extra capacity available by running overtime and/or by buying another disk pack, etc.

The incremental cost per hour of use generally is higher for an RCS than for an in-house system, although the in-house system has a higher start-up cost. This is a conventional break-even analysis situation. There is some volume of usage at which the cost of the RCS service equals the cost of the in-house service. Below that volume, the RCS costs less; above that volume, the in-house service costs less. Since usage tends to grow with time, this probably means that RCS usage becomes less economically attractive with time.

Datapro (Reference 4) discusses the results of a survey of 475 user firms. Various aspects of remote services were rated on a scale ranging from excellent to poor. The aspects of these remote services that had the fewest excellent and good ratings are the following (these were the aspects that the users were least satisfied with, even though the satisfaction was not too bad): Cost-effectiveness of RCS had the lowest percentage (59%) of excellent or good ratings. This indicates that users were most concerned with the costs of RCS. Next lowest was training effectiveness (64%) and ease of use by inexperienced people (64%). Next was the availability of technical support (67%), followed by the quality of the application packages (71%).

One reaction to these figures might be that if the poorest performance of RCS was cost-effectiveness and if 59% of the users rated the cost-effectiveness as either excellent or good, then the RCS are doing pretty well. Another interpretation might be that RCS expenditures are such a small percentage of overall DP budgets that management is not too concerned—but that, at the same time, this cost factor was the aspect of most concern.

We conclude that the costs (to the user) of RCS are of concern to data processing management and are likely to remain of concern.

Another shortcoming is that the user's data files and programs are on someone else's premises and the user has little control over their protection. The protection depends upon the security system of the RCS. While such security systems might keep out inexperienced people, they may not offer a lot of protection against experienced system programmers—depending on what operating system the RCS uses, of course.

Datapro lists some other shortcomings reported by users. Input-output speeds tend to be slow, often in the 10 to 15 characters per second range. This "limitation" is changing, however, and users can get 30, 45, 120, 240 or even higher speeds. Another shortcoming is the deterioration of response times during peak load periods. Even here, the number of complaints seems to be falling, as compared with the earlier days of time-sharing usage. Some 83% of the users contacted by Datapro rated the response times as either excellent or good.

In short, commercial RCS have a good number of advantages to offer. While there are some shortcomings, cost-effectiveness seems to be uppermost in the minds of users. Let us now consider how costs might be controlled.

Controlling RCS costs

Much of the following discussion has been drawn from Hammer (Reference 2a) and Kelley (Reference 6).

There are a number of reasons why a user's costs of RCS tend to rise—and rise perhaps more rapidly than expected. For one thing, there may be no effective monitoring of use. The people who approve payment of the RCS bills may just assume that all use is justified. Then there may be a lack of understanding by users of what the actual usage costs are. Users may perform trial-and-error problem solving at a terminal when it would be much more cost effective to do some preliminary analysis with a hand calculator. Sometimes terminals are left connected to the system for long period of unused time, such as over lunch hour. In other instances, obsolete data may be left in active storage for months or even years, instead of being transferred to archival sortage. In addition, a company may be using a number of RCS vendors when a few could provide all of the needed services and with whom volume discounts could be obtained.

Hammer describes the solution used by an electronics products manufacturer in California for controlling these costs. A five-person task force was set up in late 1971. This task force reviewed all time-sharing applications, administered vendor contracts, reviewed vendor bills, reviewed requests for new applications and services, and maintained a directory of users. Each application was reviewed in summary form first, and then those with the largest usage were reviewed in de-

tail. Such points as the following were investigated. Is fast response really needed for the application, or could remote batch or even batch processing serve as well—for part or all of the application? Does the application interface with other applications that must be on-line? Could the application be done on a programmed desk calculator? Could it be done better by another RCS vendor? What would it cost to convert to the alternative solution and how long would it take for the savings to pay back the conversion costs? If the application should stay on-line, are there any wasteful usage practices that can be eliminated?

Over a two-and-one-half year period, some 140 applications were reviewed by this task force. Of these, 50 applications were removed from on-line systems. Twenty were converted to batch or remote batch processing and another 20 were converted to an in-house time-sharing system. The remaining 50 applications were consolidated from 13 RCS vendors to two RCS vendors, with fixed annual use contracts and with discounts ranging up to 20% on the prices.

The task force also instituted a procedure of changing passwords every one or two months. This practice brought to light a number of users who had been "borrowing" someone else's password for a long period of time. The practice showed who was actually using the system. The task force also required that the RCS vendors display time and cost figures at the end of each session, so users would know what costs they were incurring. Finally, regular budgeting and accounting were instituted for all RCS usage.

Hammer reports that acceptance of the new policies was slow; users were reluctant to be controlled. But by early 1974, cumulative net savings had reached almost $1.3 million. The largest savings ($29,000 per month) came from converting some applications from on-line to batch processing. The next largest savings ($17,000 per month) was from the elimination of services that really could not justify the use of time-sharing. A savings of $16,000 per month was achieved by switching applications to other RCS vendors. About $5,000 a month was saved by reducing the waste of resources, and another $1,000 per month was saved by negotiated contracts. The cost of achieving these savings was $220,000—about $100,000 for programmer and computer time, $70,000 for administrative expenses of the task force, and $50,000 for an in-house time sharing system.

This was not a special case, says Hammer. The same type of approach has been used by other firms with which he is familiar and these, too, have achieved significant savings.

In brief, RCS costs *can* be controlled.

How RCS firms stay competitive

As the above discussion indicates, users of RCS offerings do (or should) review and monitor RCS usage, to determine how to control and reduce the costs of this usage. This in turn translates into a control and reduction of the income to the RCS vendors. What do the RCS vendors do to counteract this effort on the part of the users?

Perhaps the main, long-term practice for retaining and expanding their business is that of passing along price reductions to the users that come from the use of new technology. Higher performance CPUs, higher performance data storage, more sharing of data communications bandwidths and the more effective use of these bandwidths—all of these result in lower unit costs for the RCS vendors which competition forces them to pass along to the users.

The RCS vendors generally are able to provide users with expertise in the use of advanced technology. They become experienced in data base and data communications technology, for instance. Users frequently choose to set up new applications on RCS networks, so as to be able to concentrate on the applications and not get mired down in trying to use the new technology. Then, after the applications are running smoothly, they consider moving the applications in-house. Of course, the RCS vendors try to make their offerings even more attractive in order to retain this business.

The RCS firms also can provide experienced field staffs for helping users to develop application systems to run on RCS networks. These users may have had frustrating experiences trying to get their applications developed by corporate system development staffs, due to the "low priority" of those applications. By dealing with an RCS firm, a user may get the desired application into operation far ahead of when it could be obtained from corporate data processing.

The RCS companies may also offer more advanced software than can be obtained in-house.

The data base management facilities, query language facilities, and programming languages may be superior to what is offered by the corporate center. These companies may also offer generalized application packages that allow the user to set up a new application quickly and easily, and for relatively low charges.

Finally, some RCS firms are adopting the philosophy of "don't fight 'em, join 'em." They recognize that many users will be installing minicomputers as part of decentralized and/or distributed systems. So these RCS firms offer to help users do just that, by marketing turnkey minicomputer based systems. Most of the local processing can be done on these turnkey systems, but they are also tied into the RCS networks for obtaining computing services that are beyond their capabilities.

When market projections show that the volume of RCS business will grow at a rate faster than the computer field in general, it is because the RCS firms are taking actions such as those just described.

Conclusions

From our discussions in the field, it seems to us that some data processing executives are discouraging the use of both distributed systems and remote computing services. They appear to feel that both of these represent a threat to the corporate data processing function.

We have come across other organizations that have adopted just the opposite view—that of encouraging various components of the companies to install their own mini-computer systems and/or use RCS networks.

We believe that the use of RCS should not be looked at as a threat to the corporate data processing function but rather should be looked at as a supplement to it. In-house versus RCS is just another instance of the make-or-buy decision. In numerous cases, it will be more cost-effective to buy a computer-based service than to try to develop and offer it in-house. Further, the more sophisticated an organization is in the use of computers, the more likely it is that users will want to go outside for some of the services. This is particularly true for specialized services, when advanced technology is being used for the first time, and/or when the amount of use of the application system is low.

Another reason for looking at RCS as a supplement to in-house services is that, for most using organizations, RCS expenditures are a very small percentage of overall data processing expenditures. According to McLaughlin's survey, quoted earlier (Reference 2b), outside services represent only about 1% of the total DP budget, over a wide range in organization size. Even if the use of RCS continues to grow rapidly—say, at over 30% per year, as measured in expenditures—it would be a decade or so before these expenditures became a significant budget item. And, of course, as these expenditures grow, the more closely they are (or should be) looked at.

So it seems to us that the use of remote computing services should be considered as just another source of computing—and put under management control, just like the in-house computing services.

But the use of remote computing services is harder to administer and control than in-house services—because it is so easy to install a terminal with an acoustic coupler and begin using a service. It would be wise, we think, to set up a program like the one described by Hammer (Reference 2a) for monitoring and administering usage.

Such a program could also cover the use of in-house mini-computers. An organization's long range plan for the use of computers should include both minis and RCS. It would be well to know just what the actual use of RCS and minis is now and what it may well be in the next few years. Then a plan and an annual budget can be set up for such usage, after which actual usage can be administered relative to the plan.

In all likelihood, the use of RCS *does* have a role to play in your data processing function. Why not plan on (and for) it.

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You have probably been seeing much discussion of electronic funds transfer (EFT) systems in the public and trade press. Most of these discussions have dealt with consumer payment systems. But have you wondered how EFT might affect the way your organization collects its revenues, or pays its employees, suppliers, or stockholders? What might data processing management have to do, to prepare for EFT? While "pure" EFT may not affect most U.S. companies in the near future, some of the components of EFT systems are already in day-by-day use. Next month, we will discuss what we found happening in this newly-emerging area.

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