

COMPUTER SERVICES FOR SMALL SITES

Most medium and large size organizations use computers today, some of them in very sophisticated ways. Further, a good number of these organizations have gone through a period of consolidation and centralization of computer facilities, to reduce costs and standardize services. So it is a matter of some concern to them that small, often remote, organization units of these bigger enterprises are beginning to ask for their own in-house computer services. These units are subsidiary companies, regional offices, warehouses, feeder production plants, and the like; they have many of the characteristics of small, stand-alone businesses. The question is: how best to provide computer services to these sites—via corporate in-house networks, via commercial time sharing services, via service bureaus, or via the new small business computers. Corporate offices often feel that requests for any of the last three of these represent a loss of control and a step backward in time. We have talked to people at a number of small sites, to get their side of the story. Here is what we found.

Centralization of data processing has been the main trend during the past ten to fifteen years. The typical medium or large organization has one or two major computer centers that provide most of the data processing services for the units of that organization. Further, these centers receive the bulk of the attention in the plans, reports, and discussions of data processing services within the organization.

But such an organization might have, say, 15 small, widely dispersed operating units, with an average of 10 to 15 employees each. Each of these operating units functions very much like a small business; corporate headquarters provides financial control, in the main. Further, these units may not be in large cities and nor are they near their corporate data processing centers. None of them is large enough to justify a data processing "staff" such as a programmer, system analyst, or full-time computer operator. However, each of them wants a series of financial and management control services that the two data processing centers are not in a position to provide.

How best can the desired services be provided to these units?

Or consider another not-unusual case of the large corporation that, in addition to its main production facilities, has several widely scattered production plants employing from 100 to 500 people each. The production control requirements at each of these smaller plants are reasonably complex but are somewhat different in nature from production requirements in the major plants. Existing production control application programs won't do the job. Because of the heavy load of batch work at its data processing centers, the company is reluctant to develop fast response production control systems, using remote terminals, for each of these plants.

How can these plants best get their desired production control systems?

The problem of providing data processing services for situations such as these is complicated by several factors: (a) the small size of the units, ranging from, say, 10 to perhaps 500 employees; (b) the "unique" requirements at each site, such that

the company's existing application programs are not suitable for any of the small sites as is; (c) frequently, these units are located at rather remote points; and (d) the small size of the units means that they cannot justify a data processing staff, for either development or operations.

Some alternative solutions

Here are some of the ways that data processing services *are* being provided to small remote sites, along with some of the advantages and shortcomings of each. Note that these advantages and shortcomings do not always hold but we gather that they happen more frequently than not.

Company in-house network. If the corporate data processing center(s) provide the desired services, corporate control of programs and data is retained. Economy of scale *may* occur. On the negative side, the small units usually have a low priority for development and enhancement resources. The corporate centers favor high volume users; the small users require a proportionally higher share of attention and help than their workload justifies. Further, the costs of data communication and terminals are non-trivial, perhaps approaching the cost of in-house small computers.

Batch service bureaus. The advantages and shortcomings of batch service bureaus are well known. Batch processing is usually more economical than fast response processing. Application packages may already be available from the bureau, eliminating large development costs. However, batch processing implies delays, file printouts are needed for handling queries, and the delivery of input to the bureau and output from the bureau can be troublesome or even unreliable.

Commercial time sharing services. As compared with an in-house network, the commercial time sharing service (tss) is more likely to have generalized application packages available. The tss might be better set up for serving remote sites, either by its own network or by networks such as Telenet and Tymnet. The tss might provide development and enhancement for the small site more readily than would the corporate center. On the negative side, the programs and data for the application packages probably will not be compatible with corporate standards. The packages may offer so many options ("goodies") that costs

can rise quickly, well above the original estimates.

Small business computers. We are talking here about complete, small systems—say, 32 kbytes of memory, one or more disk or diskette storage units, one or more CRT terminals, and a line printer or high speed character printer. These units provide on-line query capability, immediate updating capability, and can be operated almost like a piece of office equipment. Local management has full responsibility for getting the data processing work done. On the negative side, the processing costs may be somewhat higher than for comparable work on a large central computer. Corporate control of programs and data is diminished. These systems may encourage "the return to 1401 days," in the words of one DP manager. And, of course, there is the problem of getting the application programs developed and maintained for these systems.

In our study of computer services for the small sites, we concentrated on the last two of these solutions. We searched out successful cases, for two reasons. For one thing, if these solutions do become widely used, it will be because of the successful cases. Secondly, we have found that there are just too many variables present to explain the unsuccessful cases. Even with the successful cases, though, we intended to learn about the problems encountered. We tried to select cases both in large cities and in remote, almost rural, locations. And we sought out users that had adopted different approaches for getting their applications programming done. To find this variety, we ended up talking to both smaller units of large organizations as well as some small, stand-alone businesses.

A key point to keep in mind while reading the following case examples is this: *most of the companies we talked to had no programming capability and none really wanted this capability.* In one or two cases, the company felt that it would be forced to develop this capability. But most had decided to buy any needed programming services from outside.

How do these companies get their application programs? There were two main sources:

- Use generalized application packages
- Use outside programming services

We will discuss the case examples in the context of how the application programs were obtained.

Generalized application packages

In our January 1977 issue, we discussed the subject of in-house development of common systems by The Coca-Cola Company, the Eastman Kodak Company, and Shell Scandinavia. These common systems were application programs designed to meet the needs of a number of similar subsidiary companies operating in different countries. Even though each subsidiary company might feel that "our needs are different," the packages could in fact be installed in subsidiary after subsidiary with essentially no change.

It is apparently quite difficult and expensive to develop truly generalized application packages, as compared with the effort to develop an application system for one particular company. If the package is to meet the needs of 3 or 4 users, then the added cost may be in the order of 10% to 15%. But if the package is to serve tens or hundreds of users, even subsidiaries within the same company, then the development costs may be at least two to three times as great as for a one-site system.

Historically, so-called "packaged" application systems have been developed to meet the needs of one particular user. If a supplier participated in the development, the supplier may have decided to try to sell the system to some other user. Typically, the package—if appropriate at all—had to be modified to meet the needs of the second user. The same thing occurred with a third user. But it was not unusual for a user to find so many changes required that it was more economical to start from scratch rather than to try to modify the package.

In our January 1977 issue, we discussed the philosophy of true generalized design—not the "cut and fit" approach just described. In generalized design, the needs of the whole population of prospective users are determined at the outset. The system is designed to meet all of those needs. This is done by identifying the true variable factors (as differentiated from "personal preference" variations) and then finding efficient ways to accommodate those variables. This process has not yet been widely practiced.

But there are some truly generalized application systems now being offered. We will begin our discussion with IBM's Industry Application Programs (IAPs), designed to run on the System 32.

IBM's IAPs

IBM has tried many approaches for providing customers with application software. One of the more recent is the IAP approach, so far offered only with the System 32. We were impressed with how easily IAPs were installed in a number of companies. We talked to several users in central Wisconsin, for instance, about 100 miles north of Madison, as representative of sites that are remote from major cities.

Consoweld Corporation, located in Wisconsin Rapids, Wisconsin, is a subsidiary of the Consolidated Papers, Inc. The parent company has annual sales of about \$300 million; Consoweld, which employs about 350 people, has sales of some \$20 million per year. Consoweld manufactures decorative laminated plastic for counter tops, furniture, and so on.

In mid-1975, Consoweld decided to replace their IBM System 3/10 with a System 3/8 and a System 32. The two computers would give them more flexibility at a slight increase in cost. At the same time, they decided to install portions of the construction management accounting system IAP for the first applications on the System 32.

The first application for the 32 was an accounts payable system that was being handled on a mechanical posting machine. The System 32 with the IAP programs arrived in late October, and parallel processing was done during November. Cutover to the new system occurred on December 1.

This conversion occurred as the year-end peak load was building up. So the people at Consoweld found it difficult to study the IBM installation guide as thoroughly as they would have liked. The few difficulties they experienced with the installation would have been largely avoided if they had been able to follow the guide, they told us. The IBM systems engineer was very helpful in getting the conversion to go as smoothly as it did.

The next package used was the general ledger package. It was installed in early 1976. Parallel operation occurred in March, with cutover in April. The package worked correctly but some manual adjustments were needed for some account balances. Gradually the manual system for providing input to the package was smoothed out so that by the end of summer the output reports were the final general ledger statements.

Consoweld did find a few minor flaws or short-

comings in the packages, none of which held up their use of the packages. No custom programming was required to adapt either package to their needs. Two flaws were reported to IBM and may be corrected in subsequent releases of the packages.

Consoweld expects to install the payroll package and is looking for a suitable raw material package. At the Wisconsin Rapids plant, they are happy with what the IAP programs have done for them.

Vetter Manufacturing Company, of Stevens Point, Wisconsin, is a manufacturer of window frames and sashes. The company employs about 240 people.

The company began to investigate new ways to perform their data processing in the spring of 1976. They selected the System 32 and the payroll portion of the manufacturing management accounting system IAP. The computer and the programs were delivered in the first week of September, payroll record data was entered—and less than two weeks after installation, the first payroll was run.

The IBM system engineer had helped to make this conversion go smoothly. During the six months before delivery, he stopped by an average of about twice a month, to check on progress and answer questions. After the equipment was delivered, he stopped by once a week for an hour or so. When the payroll was first run, he was at the site all of the day. Since that time, he has stopped by for a few minutes whenever he was in the area, to make sure that things were going all right.

One very minor program change was needed in the IAP—to delete a dollar amount from one report. The system engineer did this.

It appears that IAPs will not meet the requirements for the rest of Vetter's applications. So one person is learning RPG II programming, for writing programs for the other applications.

Cheez Co., Inc., of Wisconsin Rapids, Wisc., is a manufacturer of cheese products. The company employs about 125 people.

During the summer of 1976, the company investigated several alternative data processing systems. At the time, they were using a service bureau for their payroll and the rest of their work was done manually. They selected the IBM System 32 with IAP general ledger and payroll packages.

The computer and the packages arrived in the middle of September. The general ledger package was installed first—and the September month-end general ledger reports were produced on the system! By the middle of October, parallel payroll runs commenced and cutover to the new payroll system occurred in mid-November.

When we talked to Cheez Co., they had not yet decided whether to use the IAP accounts receivable and accounts payable packages. The data processing manager had had some RPG II training and anticipated having to do some programming if suitable packages could not be found.

Figi-Wilson Giftware Corporation, of San Diego, California, is an assembler and supplier of wholesale giftware, wall decorations, and plastic checkbook covers. The company employs an average of about 25 people.

In the summer of 1976, Figi-Wilson started looking for an in-house data processing capability. At the time, accounts receivable was done at a service bureau and other processing was done manually. They selected the IBM System 32, with the manufacturing IAP including the bill of material processor.

The decision was made in the middle of August and the computer was delivered in the middle of September. During this interim, an employee used an IBM 3741 (at IBM) to enter file data on diskettes, so that the files were converted by the time the computer arrived.

One small change was required in the bill of material package, concerning the way that inventory was valued. This change was made by IBM at extra charge.

By the first of November, the bill of material processing had been converted and was in operation. During November, conversion of order entry, inventory control, and accounts receivable occurred, with cutover on December 1. Next followed the accounts payable package. Figi-Wilson is still considering the general ledger and payroll packages.

The company has no programming capability and they have no plans to acquire this capability.

ASK Computer Services, Inc.

The MANMAN manufacturing management system is a product of ASK Computer Services, Inc., of Los Altos, California. MANMAN consists of six interacting modules for inventory control, bill of

material processing, material requirements planning, purchasing, work-in-process, and product costing. The system is an on-line, interactive, multi-user system designed for use with a Hewlett-Packard mini-computer.

Hughes Aircraft Company, Industrial Products Division, is located in Carlsbad, California. The division manufactures image and display devices and systems, industrial automation systems, and other electronic and laser equipment. There are about 500 people employed in the Carlsbad plant. The parent company, Hughes Aircraft Company, with headquarters in Los Angeles, California, has annual sales of over \$1 billion. The company's main data processing facilities are in Fullerton, California, about 50 miles north of Carlsbad.

In late 1974, a data processing manager was named for the Industrial Products Division. His main assignment was to determine how mechanized production control services might best be provided for the division. At the time, the company's data processing center in Fullerton was providing only payroll processing for the division—plus, of course, incorporating division financial figures in the company's financial reports. But local data processing needs were growing, particularly the need for a mechanized production control system.

The data processing manager had had experience with batch-type production control systems and hoped, if at all possible, to avoid this type of system. The delays involved in batch-type data processing, plus the difficulties that batch systems have in handling complex bills of material, argued for the on-line type of system, he felt. On the other hand, the development costs for a custom-made on-line system might be prohibitive. So he started looking for a packaged system.

In early 1975, he heard about ASK. After investigating the ASK package and the Hewlett-Packard equipment, he recommended that they be obtained. An order was placed in July 1975. At the time the order was placed, some customized changes were ordered for the package. The cost of these changes amounted to less than one-tenth the purchase price of the package.

Delivery of the equipment and package were delayed until the division had moved into a new building, in January 1976. The equipment was installed in February. The first few weeks were used

for training purposes, because production personnel were still adjusting to the new production facilities. Cutover to the new production control system occurred in early March.

As mentioned above, MANMAN modules include bill of material processing, material requirements planning, inventory control, purchasing, work in process control, management reporting, and product costing. The division has five very different product lines, primarily the assembly of electronic and mechanical units; essentially no fabrication is done. The MANMAN modules fitted the needs of these five diverse lines with equal facility.

The MANMAN system was largely debugged by the time the division received it. When errors were encountered, the data processing manager would call ASK and describe the problem. ASK either determined the cause from the documentation or from recreating the problem on their computer. They then changed the source code, recompiled the program, took the tape to a nearby airport and shipped it to San Diego. A division representative would pick up the tape at the San Diego airport about one hour later.

ASK is in the process of developing a financial package for the division, to go along with the production control package.

The equipment configuration used by the division consists of a Hewlett-Packard 21MX with 32K words of memory, tape drive, two 15M byte disk units, a 200 lpm printer, four CRT terminals and two terminal printers. The terminals are located in the stockroom, receiving, production control, and purchasing departments. The people who enter the data do so as part of their regular work assignments and are charged with the accuracy of the input data. The division has no programmers and no computer operators—just the data processing manager and an assistant. Another benefit is that the computer equipment requires only about one-quarter the floor space that a small, batch-type computer with associated peripheral equipment would have required. Further, the division obtains program maintenance services from ASK at a fraction of what the salary of one programmer would be.

As is typically the case when using a successful generalized system, Hughes Industrial Products Division has no desire to add programmers or analysts to its staff.

Xerox Computer Services

Xerox Computer Services, a division of the Xerox Corporation, is a commercial time sharing service with headquarters in Los Angeles, California. XCS has developed a series of proprietary application systems that are available over their time sharing network. One of these application systems is a comprehensive manufacturing management system.

Amsco-Hall Surgical Company, located in Santa Barbara, California, is a division of the American Sterilizer Co. of Erie, Pennsylvania. The parent company has annual sales of over \$140 million and employs over 3600 people. Its main data processing center is in Erie. Amsco-Hall designs and assembles pneumatic surgical cutting tools for orthopedic surgery. It currently employs about 65 people, and the business is growing rapidly.

In late 1975, essentially all of Amsco-Hall's data processing was being done manually. The inventory control application was the only one mechanized; it was being done at a local service bureau. But with the company's rapid growth (about 40% per year), management felt that further mechanization of data processing was necessary.

A new director of operations joined the company about that time. He had had experience with Xerox Computer Services during previous employment and felt that XCS might provide the needed processing services. XCS was called in to look at the operation, tell what could be done, and estimate the costs.

The XCS proposal looked attractive and in September 1975, management decided to go ahead with the service. One X1340 terminal was installed in December; this is a Diablo "daisy" printer with a keyboard, with a normal print speed of 30 characters per second.

Management decided to convert financial applications first, so as to be able to operate for all of 1976 under the new financial systems. The general ledger application was converted first, followed by the accounts payable application. Both of these were installed in about two weeks after the terminal had been installed. But by the middle of December, the director of operations and the controller became concerned. The systems were working fine. But Amsco-Hall had decided to use so many of the optional features of the systems

that the processing load (and eventually the costs) was rising faster than original estimates. They could see that when all applications had been converted, the costs would be almost double the original estimates. So they called a halt to further conversions.

As a next step, these two executives held a two-day meeting with XCS representatives in early 1976. This was a "design to cost" meeting, we were told. Each application was explored to determine just what options Amsco-Hall had to have in order to operate. Costs were estimated and compared to original cost estimates. It was recognized, of course, the increases in transaction volume would increase processing costs. What Amsco-Hall wanted to do was to come up with a no-frills system with which they could operate. Later, when management approved, some of the other desirable options could be added.

In addition to reducing costs, the no-frills systems had other advantages, we were told. It was easier to train people in their use and it was easier to make procedural revisions.

With this new plan approved, progress was rapid. Some of the optional features were eliminated from the general ledger and accounts payable programs they were using. About three weeks later, order entry, accounts receivable, and finished goods inventory control were converted. A month later, bill of material processing was installed, followed by piece part inventory control. Amsco-Hall follows the philosophy of no parallel operations. They convert to the new system; if it does not work properly, they concentrate on making it work and do not fall back on an old system.

When we talked to them, Amsco-Hall was operating according to the "design to cost" plan and they were happy with the results. Any cost increases were due to transaction volume increases, because of the company's growing business. They were just beginning to add some of the optional features that management decided it wanted but which had been eliminated during the "design to cost" meeting.

Amsco-Hall had no custom programming performed, has no programmers on its staff, and does not want any. They see changes they would like XCS to make but the changes are not crucial. The XCS systems appear to meet all of their data processing needs for the foreseeable future.

Observations about generalized packages

From these experiences, it seems clear to us that generalized application packages can provide very satisfactory data processing services for organizational units in the 25 to 500 employee size range. A given company may find that available generalized packages meet none of its needs, or only part of its needs. We would expect that, as time goes on, the coverage offered by generalized packages will be greater and greater.

Let us reemphasize a point. None of the organizations discussed above wanted programmers on their staffs. In a few instances, the companies felt that they would have to have a programming capability because the available generalized packages did not meet their full needs. If the generalized packages could do their whole jobs, that is the solution they would prefer.

A flexible retrieval and reporting system also goes a long way toward avoiding the need for in-house programming capability. With an end-user retrieval system, queries, ad hoc reports, and production reports can be created—all with no programming training.

There is a major difference of opinion among the suppliers of small business computers on how best to supply application programs. On one hand is the truly generalized application systems which can do a fine job but are difficult and expensive to develop. Where they can be used, fine; where they cannot be used, the customer is encouraged to develop in-house programming capability. The other approach says that it is more efficient to have the application programs developed for each user on a custom basis by firms that specialize in this type of work.

We will now consider some experiences with the custom programming approach.

Custom application software

With this approach, the application systems must be developed specifically for the customer by the hardware supplier, by an independent software firm, or by a turnkey system firm. The software supplier may have developed master application programs which are then tailored to meet the needs of particular customers.

It takes somewhat longer to install an application system and get it running with this approach, as compared with the generalized system approach, because of the development time and

debugging time involved. Even so, the systems can go in quite quickly.

As representative of this approach, we talked to three Basic/Four users and one Digital Equipment Corp. user.

BASIC/FOUR Corporation

Goodwin Handling Equipment Co., of Crystal Lake, Illinois, is located some 45 miles northwest of Chicago. The company does sales and service of narrow aisle fork lift trucks. It employs about 15 people.

In late 1973, Goodwin was using a commercial time sharing service for its inventory control and billing functions. But costs were high relative to the amount of work done and the company wanted to add several other financial applications. So they looked at in-house small computer systems and, in early 1974, selected Basic/Four.

The Basic/Four Corporation representatives suggested the names of several independent software firms to Goodwin, for doing the applications programming. One was selected—and that choice proved to be unfortunate. The programs that were delivered were not satisfactory. The programs would operate but were plagued with bugs, disappearing records, overflowing disk space, and so on. Further, the software firm had not seemed to grasp the essentials of the business. Goodwin continued to use these programs for about one year before finally deciding that something drastic had to be done. Basic/Four programmers attempted to fix up the programs but to no avail.

So in late 1975, Goodwin contacted another independent software firm in the Chicago area. This experience was completely different from the first one. Goodwin found that the people at this firm could “talk our language” and quickly grasped the essentials of the business. A complete new set of programs was produced in about two months. While some debugging was needed, the programs in general worked excellently from the outset. A few enhancements were made during 1976 and Goodwin now feels that they have what they need for the next several years at least.

Goodwin's remote location is not a problem either with the hardware or the software. Software problems are, in most cases, corrected by a telephone call to the software firm. For the few hardware problems that have arisen, the service

representative generally arrives within a few hours of their call.

The computer is operated by the parts manager, as a part of his job. He has learned the system and can make the program changes specified by the software firm. Goodwin has no in-house programming capability and has no plans to add it.

Sav-On Food Co., Inc., in Santa Ana, California, is a part of the Jim Bolton Group of companies. This group performs food manufacture and distribution of such food types as sausage, pepperoni, and macaroni plus corrugated boxes for handling the foods. They are also brokers for food products of other companies. Sav-On is the parent company of four companies of the group located in Southern California. Other companies of the group are in the San Francisco bay area, plus one company in Hawaii. Total sales of the 14 companies is about \$20 million per year.

Sav-On, as the parent of the Southern California companies, has been performing the data processing for those companies. In 1974, the company converted from manual systems to a batch service bureau for accounting applications. The variety of companies made the requirements reasonably complex.

By early 1975, Bolton saw the need for a faster response in the data processing function. He investigated several small, interactive systems and selected Basic/Four. Basic/Four suggested several independent software firms for producing the application programs. Bolton talked to several and selected one on the basis that "we felt comfortable with them." No application packages were found to be suitable, but the software firm had had extensive experience with comparable application systems.

The computer was delivered 43 days after the order was signed, along with the first application package. That application, invoicing, was converted about one week later. In less than four months after the computer was delivered, all eleven application systems had been installed—covering not only the Southern California companies of Bolton's group but also the Bay Area companies. The programs did have to be debugged and the software firm had people on site when new programs were being installed. After the initial debugging, most problems have been solved by telephone calls and have been fixed

within one hour.

Bolton liked the system so well that in mid-1976, he purchased the smallest Basic/Four system, copied the programs, and took both over to his Hawaiian company. Bolton himself installed the applications in that company in five working days. Sorbus, Inc., which handles maintenance for Basic/Four equipment, did the machine installation. At the time, it was the only Basic/Four computer in Hawaii.

That experience was so successful that Bolton is considering doing the same thing for the Bay Area companies.

The company has no in-house programming capability and no desire to acquire any. A flexible retrieval system allows them to answer queries, prepare ad hoc reports, and even production reports.

Lighting Distributors Inc., located in Irvine, California, is a wholesale distributor of lighting fixtures and equipment. Annual sales are in excess of \$1 million and the company employs 15 people.

The company was formed in 1971 and has grown rapidly since that time. All data processing was done manually, but in late 1975, management started looking at mechanized methods. At first, bookkeeping-type machines were investigated. But it was found that, for a little more money, a computer system could be obtained. After looking at several systems, the Basic/Four system was selected in the spring of 1976.

Basic/Four Corporation gave the company the names of several independent software firms. Management liked the first company they talked to because "they could talk our language." The equipment was delivered 60 days after the order was placed and the first application (payroll) was run a few days later. This was the only application for which a package could be used; the others were custom programmed. During the next month, data files were built for the other applications. By the end of that time, order entry, inventory control, accounts receivable, accounts payable, and general ledger were also running.

There were some debugging problems during the early days. At the outset, a representative of the software firm came to the site and might have to spend two to three hours there. Within a few weeks, such visits were unnecessary and problems could be handled over the phone. Within four

months, program bugs ceased to be a problem.

The company has no in-house programming capability and has no plans to acquire it. One person handles the computer operations function as a part of other office duties.

Digital Equipment Corporation

Johnson Printers, located in Downers Grove, Illinois, a suburb of Chicago, does commercial job shop printing. The company has 75 full-time and 10 part-time employees.

In early 1975, Johnson Printers began to investigate various alternatives for their data processing. Previously they had used a service bureau and in early 1974 had installed a small business computer. But the computer had not worked out well for them. The capacity of the system turned out to be quite a bit less than the company had been led to expect. There were frequent hardware failures that gradually increased in severity. Finally, the system was down for 2½ weeks in early 1976 and this triggered the decision to look for alternative systems with greater reliability and room for expansion.

The equipment that Johnson Printers selected was the Digital Equipment PDP-11/40. At the same time they made this decision, the company also decided that they would develop an integrated accounting system. In the new system, the data entry on a new job would start the process for setting up all records for that job through to the financial statements. The applications would not be stand-alone but rather would be tied together.

DEC recommended the names of several software firms to Johnson Printers. Several were interviewed and one was selected on the basis that "they could talk our language."

The computer was installed in December 1975. Since that time, the reliability of the equipment has been excellent, one of the objectives that Johnson Printers was seeking.

Because of the integrated nature of the applications, no packaged programs could be used. An attempt was made to use an accounts payable package but it was found that a substantial number of changes would have to be made. The system incorporates not only job costing (which is very important to printers) but also customer history. Summary information is kept on all jobs for each customer for the past four years.

Again, because of the integrated nature of the system, progress has been slower than if stand-alone applications had been developed. When we talked to them, job status, job costing, customer history, accounts payable, and part of the payroll program had been developed, tied into the integrated system, and were running.

When program bugs have occurred, Johnson Printers calls the software house. The software firm connects their computer to Johnson's by means of data communications, analyzes the trouble, makes a quick fix in the source program, recompiles, transfers the new program to Johnson, and turns control back to the Johnson computer. Bugs are therefore corrected in very short order. Johnson periodically dumps their programs to tape, with suitable backup, thus capturing such changes.

Johnson Printers does not have in-house programming capability and does not desire to have it. All programming and maintenance are handled by the software firm.

Observations about custom programming

These examples illustrate, we believe, that custom programming of the application systems is not an overly expensive or time consuming approach for small organizational units. We have not quoted the prices paid for the software because figures depend upon each specific case so much. However, each of the companies felt that it had paid a reasonable price for the software.

It is interesting to note, too, that custom programmed application packages were available in some of the cases just as soon as the computers were delivered.

Successful application programming seems to be very much a function of the ability of the software firm to communicate with the customer and to understand the customer's business problems. If the software firm can do these things, has had experience with similar applications, and can refer the customer to other satisfied clients (preferably in the same or similar line of business), the chances of success would seem to be good.

The custom programming approach may have one advantage over the generalized system approach for smaller units of big companies. That advantage is that the systems might be designed using the parent company's data definitions. Conceivably other standards might also be used, thus

reducing the "out of control" fears of corporate data processing executives.

What about turnkey systems?

Turnkey systems are generally assembled by a software firm. The hardware may be selected from one, or from more than one, equipment manufacturer. For instance, the CPU may come from one company, the disk storage from another, CRT terminals from another, and so on. The turnkey company develops the software for a particular application and sells the hardware/software/support as a package.

While we have talked to some users of turnkey systems, we have not included these cases in this report. One reason is that the situations are very similar to the cases already discussed. If the hardware/software meets the user's needs without change, then the situation is like the generalized package approach. If the turnkey supplier must modify the software, or even develop it from scratch, for the user, then the situation is like the custom software case.

There are some additional problems, however. If the turnkey supplier selects hardware from several manufacturers, the problem of responsibility in hardware maintenance arises. Finger pointing at another supplier is typical in such situations. The turnkey supplier may have a satisfactory solution for this problem, but at least that fact should be ascertained.

The turnkey system approach is based on the premise that the combination of hardware and software will be satisfactory for the user. If the user really just likes one of the two, then the custom programming approach might be preferable.

We encountered reluctance on the part of the hardware suppliers to recommend turnkey system suppliers. One reason for this, of course, is that the field sales force of the hardware supplier feels that it is in competition with the turnkey firms. The sales force clearly would prefer to sell the hardware to the user and then recommend two or more software firms for doing the programming. Another reason is, we gather, that if the turnkey firms get into trouble—financially, poor quality software, or other—then the field sales forces are called upon to help clean up the situations.

But we *have* talked to satisfied users of turnkey systems. This is a valid approach for providing

computer services for the small site. There are capable turnkey suppliers and there are marginal ones. The user must pay as much attention to selecting a turnkey supplier as to selecting, say, a computer system and an independent software firm.

No in-house programming: is it valid?

We have emphasized the point that most of the companies we talked to do not have an in-house programming capability and do not desire to have it. This is a rather significant point. One of the chief objections by corporate data processing management to the types of services we have discussed in this report is that "pretty soon each site will build up a programming and operating staff." So the question needs to be raised: is our point a valid one?

In support of the validity, it is a matter of fact that most of the sites we talked to do not have in-house programming capability and most told us emphatically that they did not want it. Such capability was being considered only by users of some generalized packages *where they could not find additional packages to meet their needs*. In all cases where the user could get all desired programs from outside sources, no in-house capability was considered.

On the other hand, none of the companies we talked to had been using their computer services very long—generally, only a year or two. Will management feel the same way about in-house programming in, say, five years?

We think the answer lies in the availability of flexible, user-oriented retrieval packages. If the non-programmer user can quickly learn to retrieve, manipulate, display, and print data—for answering queries, for ad hoc reports, and for new production reports—this answers most of the needs for in-house programming. The programming of the data validation and file update functions can then be purchased on the outside.

Only time will tell if these companies will want an in-house programming capability. Our opinion is that the methods they are now using are working well enough that the companies will continue their present policies.

If you seek generalized packages

Generalized packages have a lot to offer. They are relatively quick and easy to install. Often, the

user finds that there is no debugging period. Maintenance is performed by the supplier, if bugs are found. If truly generalized, the user has to make only minor changes in procedures in order to adapt to the use of a package.

On the negative side, the user is at the mercy of the supplier as far as enhancements and additional packages are concerned. The generalized packages may perform only a part of the overall job that the user wants done.

There is no reason why the user could not turn to independent software firms for enhancements and additional applications. But the generalized package supplier does not encourage this, we gather—and, in fact, might push the user in the direction of in-house programming.

If a large organization has a number of small sites that want their own computer services, then generalized packages would promote consistency and standardization.

Costs of generalized packages

One of the sales claims for generalized packages is that the cost to the user will be less than for custom programming. This is not necessarily true. Let us briefly consider the three main ways of paying for generalized packages.

Outright sale and maintenance charge. The supplier may offer the package for a fixed price plus an annual charge for maintenance. But the price of the package might be about what a custom programmed system could cost. Why? Because the cost of developing a truly generalized package is substantially more than the cost of a custom system. Add to this the cost of marketing the package and conducting the business and a non-trivial price results. It is quite possible, of course, that the generalized package might be better designed and documented.

Installation charge and monthly lease. At first, this looks like it would be a much less expensive approach than custom programming. But if the lease terms are “from here to eternity,” then the amount paid to the supplier in, say, four years might well exceed the cost of custom programming. Some suppliers offer “paid up” leases, where lease payments cease after two or three years. This would seem to be a much more attractive arrangement for the user.

Usage charge on commercial time sharing system. This approach requires the least investment

by the user. But once again, the charges are continually imposed, month after month. Moreover, the charges might vary linearly with volume. Counting volume growth and continuing usage charges, this approach might also cost more in four years than would custom programming.

Generalized packages might be attractive economically. But to really determine this, look at total costs over at least a four to five year time period.

Selecting and installing a generalized system

Just because a package is generalized does not mean that it is right for any particular company. What the package does and what it requires of the user must be carefully investigated. Get a precise definition of all input requirements—what data fields, what time schedules, what turnaround of corrections for detected errors? Get a precise definition of all outputs produced by the system—how well can they replace existing reports and documents, how will queries be answered, how will ad hoc reports be produced? Examine the decision rules used by the system (for example, the method of aging accounts receivable balances). What help will the supplier provide in preparation for and in making the installation? How understandable is the package operating instructions for the user? What adjustments in company procedures will be needed in order to use the package? What custom programming will the supplier do to fit the package to the user's needs?

Having found a suitable generalized package, the user should make one person at the site fully responsible for installing the package. This person should *not* be a supplier representative. Further, the higher this person is in the management of the site, the better. This person should thoroughly study the package installation guidelines and then lay out a detailed plan for making the installation. Finally, try to avoid peak load periods for making the installation.

If you prefer customized programs

If you cannot find generalized packages for any or all of your data processing, then you may want to buy custom programming services from outside—from the hardware supplier, from an independent software firm, or from a turnkey system firm.

Some of the cases described in this report indicate the advantages and risks of this approach. On the plus side, the application systems can be tailored to the user's specific needs. If the user is a part of a large company, then corporate standard data definitions and decision rules might be used. On the negative side, if the supplier and user do not communicate well, the user might end up with unsatisfactory programs—numerous bugs, do not do job quite right, do not do whole job, hard to change, and so on.

One point we have heard time and again—be *very* careful about soliciting proposals for the programming and then taking the lowest priced proposal. Yes, such proposals will uncover significant differences in the prices. But the lowest priced proposals might be quite unsatisfactory. The suppliers may have made too superficial a study of the requirements, or may have misunderstood them. If a supplier gets the job and then realizes it will be a money-losing one, then all sorts of bad things start to happen. Corners are cut, portions of the system eliminated, testing is reduced—and the user then lives in misery with the results.

If the supplier has programmed the same applications a number of times previously for other companies, talk to some of those customers and find out how satisfied they are.

There is another step that should be considered, whether or not the supplier has programmed the application(s) before. That step is to break the system building process into two phases—a specification phase and a building phase. For some fixed price, the supplier should study the requirements and develop the specifications for the new system(s). These specifications should define precisely what the new system(s) would do—what inputs are required, what outputs would be produced, what decision rules would be used, and so on. The supplier would also be in a position to give a realistic fixed price quotation for building the system(s). If the customer does not like what is presented, at least two options should be provided. One, the supplier should correct the specifications at no extra charge until they meet the customer's needs. Or two, the customer should pay the supplier the fixed price for the specifications, take the specifications, and give the job to another supplier.

The top information executive

In recent issues, we have been discussing what appears to be an emerging new position—the top information executive within an organization. We have pointed out that this position might eventually have responsibility for the computer services, communications services, clerical and filing services, and the other information handling activities within the organization. The purpose of creating this new position would be to try to deal with all of these activities in a more organized, more efficient manner.

In this report, we have pointed out that it is now practical to provide computer services for small, possibly remote sites. If these sites feel that they cannot obtain adequate services within a reasonable time frame from the corporate computer department, then they will increasingly demand the right to go outside for the services.

But why bring up the idea of a top information executive here, you might ask. Why isn't this something for the top data processing executive to deal with? The reason, as we see it, is that the small business computer for the small site opens the door for a variety of other services. These sites will become interested in word processing services, computer message systems, remote computing services, and so on. These services do start to get beyond the jurisdiction of the top data processing executive, we suspect.

The recent announcements of the IBM Series 1 and the Univac BC/7 small business computers are of interest here. IBM's marketing strategy for the Series 1 appears to support the concept of central control of data processing. The Series 1 has a very limited software support at present. IBM seems to be saying that if the small organizational unit of the large company wants a Series 1, it should get it through corporate headquarters and have the corporate computer department do the programming. The BC/7, on the other hand, seems to be aimed at small, first-time users of computers. More software support is provided, with particular emphasis at the outset on wholesale distribution and manufacturing applications.

With either system, we suspect that software will become available for providing word processing services, computer message services, and other computer-based services on these systems.

More and more organizational units of enter-

prises will be using more and more computer-based services. Some of these services extend beyond the traditional boundaries of data processing. So the need for a top information executive should be viewed with this development in mind. The use of these services in an organized, efficient manner deserves management's attention. Further, the use of these services is not in the distant future, it is arriving now.

Addendum

As we went to press, IBM made two announcements in the small business computer area. One, System 34 is an upgrade of the System 32. The 34 can handle up to eight terminals and/or printers, has extended communications capabilities, and has a fixed disk storage facility of up to 27 million

bytes. System 32 programs and IAPS can be run on System 34.

The second announcement concerned the Series 1. An operating system with multi-programming capabilities was added. Fortran and PL/1 programming languages are offered (but COBOL is not). The only Series 1 applications software so far offered by IBM is for facilities management/power management, for monitoring purposes.

These announcements indicate that IBM is moving even more aggressively into the area of small business computers. Moreover, they seem to be in harmony with our discussions in this issue. Small business units are going to receive an increasing share of attention in the computer field.

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