

UIC John Marshall Journal of Information Technology & Privacy Law

Volume 5
Issue 4 *Computer/Law Journal - Spring 1985*

Article 2

Spring 1985

Mainframe Computer Conversions: Buyer & Seller Beware, 5 Computer L.J. 469 (1985)

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MAINFRAME COMPUTER CONVERSIONS: BUYER AND SELLER BEWARE†

By ARTHUR FAKES*

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* This Article is based on the author's experiences with nearly a hundred mainframe computer conversions while employed by a major mainframe computer vendor. In order to guard against the danger of inaccurately generalizing from his experiences to the conversion problems and concerns of other mainframe vendors, independent conversion service suppliers, and their customers, the author verified the information contained in this Article with users of mainframes supplied by the other major vendors in the United States, with past and present marketing and technical representatives from many of these companies, with past and present outside counsel for some of them, and with large and small independent conversion service suppliers. The technical content of the Article has also been verified by computer programmers and systems analysts with extensive work and management experience on mainframe computer software, data and equipment conversion projects. The author assumes complete responsibility for the accuracy of this Article and the soundness of its recommendations.

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This Article is intended to forewarn and forearm counsel representing a mainframe computer user with respect to one of the most costly computer-related problems his client may encounter: an unsuccessful mainframe computer conversion. The information and recommendations that follow should expand or at least reinforce trial counsel's understanding of conversion-related litigation, but their primary purpose is to enable advisory counsel to help their mainframe-computer-user clients avoid unsatisfactory or unsuccessful conversion transactions. While this Article alone will not make the reader an expert in drafting or negotiating conversion agreements, it should enable counsel with no data processing background to advise his mainframe-user client about the major risks involved in a conversion transaction and to help his client minimize those risks.

Mainframe computer conversions are complex, technical transactions that are undertaken in a variety of situations. Ideally a client will request counsel's advice regarding such a project before it begins. More often than not, however, the mainframe user will not realize he needs legal assistance with the conversion.¹ Counsel must be able to

1. Legal assistance is not directly required for all mainframe computer conversions. Small projects requiring only a few hundred man-hours of labor are sometimes undertaken by the computer user's data processing staff without outside technical help from independent conversion service suppliers or the computer vendor. These conversions are relatively simple in-house data processing projects not requiring advice from counsel except with respect to related hardware and software acquisition matters. Some of these simple projects are successful, and some are not, but the user's management and data processing staff are solely responsible for the conversion work.

Medium-sized and large conversion projects also may be undertaken in-house. Although these projects require man-years of effort, and counsel becomes involved in the acquisition of new equipment and software, once again the user is solely responsible for the conversion work. Hence, counsel is not directly concerned with planning, structuring, negotiating or contracting for conversion services, or with the success of the project.

However, most medium-sized and large conversions seem to involve assistance from outside programmers and system analysts. Many mainframe users cannot afford to stop all productive activity and assign all data processing personnel to a conversion project because their business would come to a standstill. Some users would not have sufficient personnel or expertise to complete the project in a reasonable time if their data processing staff dropped all other work in order to undertake the project. Regardless of the size of the project, if outside technical help is utilized, sound legal assistance tends to maximize the likelihood of its success. The greater the outside technical assistance, the less likely it is that the conversion will be successful without the involvement of experienced counsel. This Article addresses conversions involving independent consultants, and vendor/service supplier programmers and system analysts, not projects undertaken entirely by the user's in-house personnel.

recognize when a conversion is contemplated or underway in order to warn, advise and help mainframe clients. This ability can be developed only through gaining an understanding of the basic technical aspects of conversions and the situations in which they typically occur.

I. MAINFRAME COMPUTERS AND THEIR SOFTWARE

To understand what a mainframe computer conversion is, one must first understand some of the basic characteristics of mainframe computers and their software. While they vary in size, cost, and capability, mainframe computers are the largest, most expensive and most capable computers in use today. Although some are designed for a particular kind of work, most mainframes are general purpose computers designed to perform a variety of data processing tasks.

Many kinds of software can be found in operation on the typical general purpose mainframe. For purposes of this Article, the most important kinds are application software and operating system software. Application software performs a specific task, such as accounts payable information processing. When a programmer creates an application software program intended for use on a mainframe computer, his work product is called "source code." Source code cannot be used by today's mainframe computers. It must be translated into its "object code" or "load module" equivalent. Object code is sometimes referred to as "machine language" because it is accepted, understood, and used by the computer.²

Operating system software controls the computer in much the same manner as a traffic light controls the flow of automobile and pedestrian traffic at a busy city intersection. It initiates and coordinates the execution of data processing jobs through its manipulation of the computer's central and communication processors, memory, and input-output devices. Operating system software is designed to operate and control one or more specific computers made by a particular manufacturer or group of manufacturers.³ Hence it is sometimes said to be hardware dependent.

2. Compile software translates source code into object code.

3. The exception, of course, is Unix. Unix is a trademark of AT&T's Bell Laboratories and the name of operating system software that was not designed to operate and control computers made by a particular manufacturer. Instead it was designed to be a flexible operating system that many manufacturers could employ. Because of its capabilities, some mainframe and microcomputer vendors have begun to market machines with a Unix operating system. In theory, application software operating on a mainframe computer with a Unix operating system could be used without change on another vendor's mainframe using a Unix operating system, thereby eliminating the need for an application software conversion. In reality, problems sometimes arise because there are several versions of Unix. If the new computer does not use the same version of Unix as the replaced

A mainframe computer conversion involves changes in a mainframe user's data or application software or both. Data is recorded in a mainframe's memory in a particular arrangement or format. When a computer user replaces his old mainframe with a new one, and the two have different data formats, or the design of their operating system software is different, the user must either (1) change his data format or application software, or both, so that his data and application packages will operate on the replacement machine or (2) adopt a conversion delay or avoidance strategy. Such a change is known as a data or software conversion. Because the change is necessitated by a change in mainframe computers, it is often called a mainframe computer conversion.⁴

mainframe, the application software from the replaced machine will have difficulty functioning on the replacement mainframe.

Unix has been criticized as being more flexible than is necessary in furnishing problem solving options, as being difficult to use, and as being slow. For these and other reasons it is difficult to say at this time whether Unix will become an industry standard operating system which eventually eliminates the need for application software conversions.

4. Many circumstances give rise to data and/or software conversions which do not involve mainframe computers, or involve only one mainframe. For example, where a small company using only calculating and bookkeeping machines to process its data acquires a microcomputer, the form of its mechanically recorded data must be changed or converted before it will be suitable for processing by the new computer. If the company subsequently purchases all of its data-processing services from a service supplier that uses a mainframe computer, the data and software used on the microcomputer is seldom usable on the mainframe without conversion. If the company later acquires a mainframe and cancels its service supplier, the data or software used on the supplier's mainframe may need to be converted before it will be accepted by the new mainframe. Our hypothetical company could undergo three data conversions, but only the last would be necessitated by a change in the use of mainframe computers and therefore qualify as a mainframe computer conversion. Many of the principles set forth in this Article will apply to all data and software conversions regardless of whether they involve a mainframe computer, or involve only one rather than two or more mainframes.

As suggested above, the definition of a mainframe computer conversion consists of several necessary conditions some of which contain variables. First, there must be a change from the use of one mainframe to another to accomplish the same data processing jobs. Second, the latter computer must use operating system software with a different design, or it must arrange or store its data differently. Third, the user must decide to undertake a conversion rather than employ a conversion avoidance or delay strategy. Fourth, the user must implement this decision. Given these conditions, either data or application software, or both, will be changed to operate on the second computer. Any of these changes accompanied by the four conditions is a mainframe computer conversion.

As used in this Article, a "conversion" refers to a project in which a mainframe computer's application software or data or both are changed to allow them to be used on another mainframe computer. A conversion transaction includes negotiations between the parties and such a project. It is interesting to note that in the educational and game software industry the term "conversion" is also used in another sense. Most educational and game software is designed for use on microcomputers and the term "conversion" is often used to refer to the converted software rather than, or in addition to, the process of

II. CIRCUMSTANCES IN WHICH CONVERSIONS OCCUR

As indicated, a second prerequisite for understanding mainframe conversions is an understanding of the situations in which they occur. It is difficult to generalize about these situations not only because they vary significantly, but also because users can adopt conversion avoidance or delay strategies. What follows is a simplified explanation of those strategies and the situation that most often gives rise to a mainframe conversion.

A. THE REPLACEMENT MAINFRAME

Most commonly, mainframe computer conversions occur when replacing one mainframe computer with another. This situation usually develops as a result of the user's needs to obtain higher volume or faster data processing service than his current computer can provide. Acquiring a new, more capable mainframe is one way to obtain such improved service.⁵ If the new mainframe is acquired from the same manufacturer, the new computer will sometimes use the same operating system software along with the same data format or storage arrangement, thereby eliminating the need for a conversion. However, if the manufacturer changed the design of the operating system software used on the new computer, or the way in which its data is arranged, the user's existing data or application software will not operate on the new computer as is. While some data and application software could be replaced or abandoned, unique or important data and software must

converting the software. Thus a game software package designed to operate on one vendor's microcomputer might be converted to allow it to operate on another vendor's microcomputer with a different operating system, and the new version of the package would be called a "conversion" of the original version. The point to remember, then, is that care must be taken when discussing "conversions" in order to avoid confusion.

5. Other ways to obtain higher volume or faster data processing service include the addition of new application software to the existing programs, the replacement of current application programs with more capable or faster packages, a change in personnel, and the acquisition of "upgrade" equipment. The capability and speed of many mainframe computers can be improved without conversion by simply adding equipment. Memory can be expanded by adding tape or disk memory units. Processing capability can be increased by adding central processing units, and communication capability can be improved by adding communication processors. Eventually, however, expansion and enhancement through upgrade equipment will no longer be possible. When the maximum equipment configuration has been assembled yet additional or faster service is required, the user may: ignore the problem and watch his overloaded computer provide diminishing service; acquire a second, identical or smaller mainframe and divide work between the two; send data processing jobs to a service bureau; acquire a more capable mainframe to replace, or share the load of, the current computer; or adopt an unusual solution such as selling his mainframe and hiring a facilities management company to furnish data-processing services through a mainframe installed in his facility.

either be converted to versions that will operate on the new computer, or used without change in a conversion avoidance or delay strategy.

If a client acquired a new mainframe computer from another manufacturer and the new computer used the same or a virtually identical data format and the same or similar operating system software, the replacement computer will accept most, if not all, current data and application software without conversion. Such a replacement is said to be "compatible" with the original mainframe because of the compatibility of their data formats and the designs of their operating system software. However, if the new mainframe is not compatible with the old computer, the user's existing data or application software will not operate on the new computer as is.

B. CONVERSION DELAY AND AVOIDANCE STRATEGIES

The user can avoid a conversion by abandoning his application software and leaving his data in the current computer's memory rather than converting and transferring it to the new computer. The application software could be replaced with similar software designed to perform the same data processing tasks on the new computer. The data recorded in the old computer's memory could be entered into the replacement's memory without first being changed or converted.⁶ When the user's computer operators type or "key" the data into the new machine's memory it would be automatically arranged in the data format used by the new computer. Replacing application software is occasionally feasible, but keying all of the user's data into the replacement mainframe is rarely feasible because of its volume and the prohibitive cost of manually entering the data into the new mainframe's memory.

A conversion can also be avoided by transferring some of the user's data processing tasks to the new machine while maintaining the old computer and restructuring the transferred tasks on new application software acceptable to the new mainframe. Here only some of the user's data would have to be keyed into the new machine's memory.

A third avoidance strategy is to use the new mainframe only for new data processing tasks requiring new application software and data while retaining the old computer to perform all of the existing tasks.

6. There are several methods of converting data and transferring it to a new mainframe's memory. While they are too technical to describe in detail here, they include: (1) using a "utility" software program, which is sometimes called "conversion aid" software, to convert the data into the format used by the new computer; and (2) using an "optical scanner." An optical scanner can read typewritten or printed documents and transfer their content to the new computer's memory where it will be arranged in the format used by the new computer just as manually entered data would be. In the future it will be possible to record data in a commercial computer's memory through verbal communication.

Unfortunately, the high cost of maintenance for the old mainframe often makes this alternative financially unattractive.

An alternative to an avoidance strategy is a delay strategy involving the use of a third computer. This alternative is sometimes called a "migration." As noted earlier, all mainframes made by a manufacturer may not have the same operating system software. In fact, most manufacturers make several families of mainframes with operating system software designed for each family. A few manufacturers make a type of mainframe capable of using two kinds of operating system software. By interacting with two mainframes having different operating system software, this third computer can be used to allow the gradual transfer of data processing operations from the old to the new computer through a combination of conversion and conversion avoidance efforts. An advantage of such a migration is that it can be accomplished in the normal course of business over a long period rather than in a high-pressure project that disrupts business. A major disadvantage, however, is the cost of the three computers necessary for the migration. The three-computer migration can be used as an indefinite delay strategy since no conversion is required while the computers operate in concert.

III. LITIGATION

A. FACTORS EXPLAINING THE DEARTH OF CONVERSION LITIGATION

Few transactions involving computers are as likely to produce major disputes as mainframe conversions. Yet few of these disputes are litigated. Several factors explain the dearth of cases arising from conversions.

First, the high cost of litigation and its disruptive impact upon normal business activity are always considerations arguing against litigation. Businessmen prefer settlement over preparing for, traveling to, and testifying at depositions and trial.

Another reason conversion related disputes are resolved without resort to the judicial system is that in most cases both parties contribute to the transaction's failure. This contribution generally makes the outcome of any litigation uncertain. When coupled with the high cost and disruptive impact of lawsuits mentioned above, this uncertainty makes litigation especially unattractive.

Both parties may contribute to a conversion's failure by failing to engage in adequate prior planning. As discussed below, extensive prior planning is critical. Another form of contribution to a project's failure is the buyer's failure or refusal to recognize the fundamental business nature of a conversion transaction and his responsibilities in that transaction. A conversion is a "buyer beware" transaction in which the

seller also faces major risks. The buyer of conversion services has the ultimate responsibility of structuring the conversion project to maximize the likelihood of its success and to minimize his risks. Many buyers never fully understand this elementary fact, and many of those who do nevertheless underestimate the risks involved and fail to take steps to minimize them.

Well intentioned, sophisticated conversion service suppliers depend upon information supplied by the buyer's data processing staff in the planning phase of the transaction. Another way in which the conversion service buyer frequently contributes to the project's failure is by furnishing the service supplier with incomplete or inaccurate information.

A fourth way in which a computer user purchasing conversion services contributes to the project's failure is by making changes in the data or software undergoing conversion. Few users can resist the temptation to improve software while it is being converted. Improvements made during conversions are always desirable and beneficial, but they disrupt the conversion project's work schedule, and create the need for other changes in data or software which further delay completion of the project. Data and software are valuable assets that should not be tampered with until after their conversion is completed. The increase in data processing capability that a new mainframe and the converted data and software will give the user in the near future is much more important than the few improvements made during the conversion. The user can always improve his newly converted software after the conversion project has been completed.

A third explanation for the lack of litigation in this area is the conversion service supplier's fear of losing the service buyer as a customer for other goods or services such as equipment and software. Some suppliers will absorb thousands of dollars in corrective activity expenses in order to guard against the loss of a mainframe customer. While these expenses will often be absorbed whether or not the user is responsible for the unsatisfactory conversion work product, less will be absorbed if the user is completely responsible than if the supplier shares the blame.⁷

7. System integrators and mainframe manufacturers who furnish conversion services, lease or sell equipment, and license or sell software to a mainframe computer user, fully recognize that the outcome of the conversion project will have a bearing on whether the parties continue to do business after the equipment lease expires, or the current mainframe is no longer able to keep up with expanding data processing requirements. Profits made on future business from such a long-term customer will often exceed the unanticipated expenditures required to correct and complete over-budget conversion work. In addition, if the customer is not satisfied, there is a danger of losing his business to a competitor who furnishes a noncompatible mainframe. Hence, where the user's person-

Without regard to whether the conversion service supplier furnishes other goods or services, a fourth reason for the lack of conversion related litigation is the supplier's dislike for negative publicity. Service suppliers seldom sue a customer because they fear that news of the suit will spread among prospective and existing customers and make them apprehensive about purchasing services in the future. The fact that an occasional lawsuit would tend to keep unscrupulous customers from taking advantage of the supplier is considered to be of secondary importance.

News of suits against suppliers generates more extensive and longer lasting apprehension about doing business with them than suits filed by them. News that a supplier has been sued makes prospective customers who have never before done business with the supplier uneasy about hiring him for conversion work. The supplier immediately loses some business in highly competitive situations, encounters some additional difficulty in negotiating new contracts, and is required to furnish more performance guarantees than he normally would supply in order to obtain business. Some current customers react to such news by immediately holding the supplier to all of his performance commit-

nel, or both the user's and supplier's technical staffs, underestimate the time required to complete the conversion project, the supplier may voluntarily absorb all cost overruns incurred in completing the project. The foregoing business considerations can make absorbing these cost overruns a matter of secondary importance.

Indeed, these considerations take on even greater weight if the supplier is solely to blame for defects in the conversion work. Both users and suppliers are sometimes misled by the suppliers' sales personnel. Unfortunately, some conversion service salesmen are interested only in earning their commission from the project and will say whatever is required to both parties to ensure that they reach an agreement. These salesmen realize that there is little or no possibility of repeat business and commissions in the foreseeable future after a conversion project is successfully completed. They also know that if the project fails after some minimal initial progress due to their misrepresentations and unauthorized commitments that cannot be fulfilled, they can easily find work elsewhere in the rapidly growing computer industry and probably avoid having to return initial commissions received as a result of the transaction. If they work for a supplier that does not discipline its sales force, they know they can make excuses, shift blame and reasonably hope to avoid censure and commission chargebacks as well as termination when the conversion project they oversold and underpriced develops costly problems. Most conversion service suppliers will go out of their way to correct and complete the project at little or no cost to the user after they discover that their salesman has taken advantage of both parties. The mainframe user's willingness to accept project delays while the supplier corrects and completes the project at its expense is the essential element of the user's decision not to sue the supplier in this situation.

From the computer user's standpoint, the main business reason explaining the lack of litigation over unsatisfactory conversions may be the fear of his data processing personnel that legal action would harm their careers because they recommended the conversion service supplier. This fear encourages the data processing staff to advise against litigation when it is considered by senior executives.

ments instead of continuing to overlook minor or moderate defects or delays. Some current customers are much more inclined to consider filing suit against the supplier after learning that another mainframe user has done so than they were before the suit came to their attention. In sum, news of a suit against a supplier can trigger a variety of reactions with a negative impact on the supplier's business. Perhaps then, it is not surprising that conversion service suppliers tend to go out of their way to first avoid, and if that fails, to settle lawsuits.

B. REPORTED CASES CONCERNING CONVERSIONS

For all of these reasons, there are few reported cases involving conversion transactions. One such case is *National Cash Register Co. v. Marshall Savings & Loan Association*.⁸ In that case, Marshall Savings (Marshall) agreed to purchase a computer from the National Cash Register Company (National) in a contract that stated: "The Purchaser shall pay National's invoices when rendered, said invoices to be rendered when the System has been delivered, installed and certified by National as being ready for use."⁹ Marshall wanted its data converted so that it could be used on the new computer, but apparently never mentioned the conversion in the purchase contract or any other agreement or correspondence. In discussions with National, Marshall agreed that its employees would convert its data under the supervision of National's personnel. Marshall started the conversion work but then stopped the project at an undefined point and the conversion was never completed. As a result, the new computer never functioned as planned. National filed suit for the purchase price, and both parties moved for summary judgment. The trial court found in favor of National and awarded damages.

On appeal, Marshall argued that because the data was not converted, the computer could not operate as intended and the purchase price never became due as a result. The court noted that Marshall had received a written certification that the system was installed, tested and available for use, and that Marshall did not dispute this notice. Later, Marshall representatives verbally promised to pay for the system. Marshall also conceded that it was responsible for the failure to proceed with the conversion. National argued that the system was "ready for use" when it was physically installed and operational. At that point it was ready for Marshall's intended use as soon as Marshall converted its data. The court found that Marshall had accepted this interpretation of the contract and affirmed the trial court's decision.

Marshall emphasizes the importance of expressly addressing the

8. 415 F.2d 1131 (7th Cir. 1969).

9. *Id.* at 1132.

conversion in the parties' contract. Another case that makes the same point, among others, is *Applied Data Processing, Inc. v. Burroughs Corp.*,¹⁰ a diversity action arising from the lease of a Burroughs mainframe computer to Applied Data Processing (ADP). In this case, ADP alleged that the Burroughs computer failed to function properly and claimed damages for breach of express and implied warranties and fraudulent misrepresentation.¹¹

According to ADP's allegations, it was a "service bureau" using an IBM mainframe to furnish electronic data processing services to commercial clients. In 1968, ADP's business was growing so rapidly that it needed greater data processing capability. Early that year it investigated alternative computer systems and quickly narrowed its choices to those offered by IBM and Burroughs. During 1968 and early 1969, ADP frequently met with Burroughs' representatives advising them of its particular needs, describing the operations the new computer would be required to perform, and defining the level of reliability required.

Following its investigations, ADP was leaning toward acquiring a more sophisticated IBM computer rather than switching to Burroughs, because the switch would require ADP to have all of its application programs converted before they would operate on the Burroughs computer. ADP wanted to avoid this expense and the retraining of its employees which the conversion would entail. If ADP selected the IBM system, only minimal retraining and minor adjustments would be required to make the company's existing software operate on the new system.¹² This adjustment could be accomplished gradually in the normal course of business.

When ADP advised Burroughs of its preliminary decision to acquire a new IBM mainframe, Burroughs claimed that its mainframe was so efficient that the conversion costs would soon be recovered. Burroughs allegedly represented and warranted that its mainframe had a larger memory and lower cost than the IBM computer, that it was suitable for use in a commercial data processing service center, and that it would be as reliable as other computers then in service. "In general ADP [claimed that] Burroughs represented and warranted the equipment as merchantable and fit for the purposes intended by ADP, and that Burroughs either knew or should have known these representa-

10. 394 F. Supp. 504 (D. Conn. 1975).

11. A pre-trial order severed the damage issue for early analysis and determination, leaving liability to be determined at trial. The parties stipulated to ADP's allegations of fact for the purposes of the court's determination, and ADP agreed to withdraw any claims for damages determined to be unrecoverable.

12. The new IBM mainframe in competition with the Burroughs computer was an IBM 360, Model 25 which was largely compatible with ADP's IBM 360, Model 20.

tions were false."¹³ Additionally, ADP alleged that Burroughs made these representations and warranties for the purpose of inducing ADP to acquire the Burroughs mainframe, and that in reliance upon these representations, ADP leased the Burroughs computer.

The Burroughs mainframe was delivered in May, 1969, but because of serious malfunctions was not declared "ready for use" by Burroughs until October, 1969. After the declaration, the computer's performance fell below the level represented and warranted, but Burroughs repeatedly assured ADP that the difficulties were all start-up problems that would be resolved.

The court did not mention the existence of a conversion contract or indicate that the project was conducted according to a written plan, but it is clear that ADP began converting its programs in 1969. From late January, 1970, through March, 1970, the computer's continued malfunction required some programs to be converted twice. Because of the malfunctions and errors, Burroughs stopped billing lease charges in March and attempted repairs. In April, 1970, Burroughs claimed that the problems had been solved and resumed its billing of lease charges. The problems continued, however, and the Burroughs mainframe continued to perform below the level of reliability warranted by the company. In May, 1970, ADP stopped the conversion and in July Burroughs agreed to an early termination of the lease.

In argument on the issue of damages, Burroughs maintained that all damages claimed by ADP in its breach of contract counts were consequential damages excluded by the parties' lease. The court disagreed and found that some of the damages claimed were direct and recoverable. The court also determined that ADP's theory of misrepresentation would support the award of: (1) the difference between the value of the computer as it had been represented and its value as installed; (2) consequential damages directly and proximately resulting from the misrepresentation; and (3) those damages characterized as consequential and excluded on the contract claims.

No detailed specifications defining the software or data to be converted, no written conversion plan, and no conversion contract were placed in evidence in either of these cases. At the least, both cases emphasize the importance of a conversion contract.

ADP took a few prudent steps in its approach to the acquisition of a new computer, but the same cannot be said of Marshall. One of the things ADP did correctly was its thorough investigation before acquiring a new computer. Such an investigation is the first step in the proper approach to a conversion project. Further, ADP spoke with two vendors before deciding which mainframe to acquire. Sophisticated elec-

13. 394 F. Supp. at 506.

tronic data processing equipment purchasers and lessees often negotiate with two or three vendors at once, playing one against another, so as to maximize the concessions they receive.

The following section discusses the correct approach to a conversion project and explains the additional steps ADP should have taken following its investigation.

IV. THE PROPER APPROACH TO CONVERSION PROJECTS

Recognizing that a conversion is contemplated or underway, understanding some of the problems that arise in conversion projects, and becoming familiar with conversion cases all combine to assist counsel in warning and advising his computer client about some of the major risks inherent in a conversion transaction. More is needed, however, to enable counsel to effectively help his client with his conversion project. Counsel must be able to recommend an approach to conversion projects involving significant outside technical assistance that will increase the likelihood of their success. The remainder of this Article suggests such an approach.

The primary ingredients of a successful conversion are sufficient manpower, capable and dedicated user and seller staffs, and a good approach including specifications, a conversion plan and a tailor-made conversion contract. Some conversions fail because of insufficient, inexperienced or incompetent user or seller data processing personnel; a few fail for lack of data processing staff or management dedication; but most fail because the approach adopted was naive and inadequate.

An essential element of an effective approach is prior planning. The mainframe computer user should begin his planning when he first considers making a major change in his computer or software that could be accomplished through a conversion. The person in charge of data processing or management information services should identify in general terms the application programs and data to be converted. He should gather information about conversions, migrations and other methods of accomplishing the desired change.¹⁴ Based on this informa-

14. There are several commonly used methods of gathering information about ways to improve data processing productivity. For example, rather than expending valuable management time on an investigation, the user may retain a consultant to explore its options. Either the user or a consultant could issue a Request For Information (RFI) to companies capable of providing conversion assistance or other equipment and software resources and services that might be used to accomplish the desired improvement. The RFI should describe the user's business, his current mainframe equipment, software and volume of data processing work, his data processing needs and the data and software he has tentatively identified for conversion if that option is selected. Responses will typically discuss conversion, migration and other options, provide some cost information, such as hourly charges for system analysts and programmers, and recommend a course of action.

tion, he should prepare a feasibility study for review by senior management. Only after this process is complete should a conversion decision be made.

If a conversion is desirable or necessary, the software and data to be converted should be precisely defined in detailed technical specifications. A conversion plan should be prepared that separates the software and data and arranges their conversion in a sensible sequence with tests, events, or dates, referred to as "milestones," for the completion of each segment. If the user's data processing staff has insufficient manpower, time, experience or knowledge to attempt the conversion, a Request For Proposal (RFP) containing this information should be sent to several companies capable of undertaking the project.¹⁵ The successful bidder's proposal should become a component of the parties' conversion service contract.

Users commonly ask their mainframe supplier, and sometimes its competitors, to prepare a quote or a proposal for a new mainframe and any conversion work required without first investigating non-conversion options. Such requests may include a requirement that the supplier undertake the conversion work without user assistance.

If the manufacturer takes complete responsibility for the work, promising expressly or by implication to give the user converted software or data that he may put in productive use on a new mainframe without effort on his part other than turning the new computer on and loading the data or software into memory, the conversion is called a "turnkey." Where responsibility for the conversion work is shared between the conversion service supplier and the user, the project may also be characterized as a turnkey if the supplier retains the ultimate responsibility for completion of the project. For lack of a better label,

They may also furnish qualified estimates of the time required to complete the course of action they recommend. In any case, the responses should provide sufficient data to permit the preparation of a sound feasibility study.

Another method of gathering information is to ask the user's current mainframe supplier to prepare a formal study of data processing needs and possible solutions. Yet another is to ask data processing consultants for such a study and recommendation. Some data processing consultants are sufficiently knowledgeable to prepare this type of study without first seeking information from conversion service suppliers.

15. If he obtains a formal study from his mainframe supplier, a consultant or a conversion service supplier, the computer user may not feel the need to issue an RFI or RFP. However, prudent users proceed with one or both in order to obtain specific technical data and various service commitments in the responses, or "bids," that are not contained in the study. Such users will solicit bids from a number of mainframe manufacturers, which are sometimes called "hardware houses," other conversion service suppliers, such as "conversion houses" specializing in conversion work, and other equipment, software and service suppliers in order to obtain options to the course of action recommended by the study's author. These options and the study's recommendation should be analyzed in the user's feasibility study.

such a project is sometimes called a "joint-effort turnkey." In both situations, users frequently require completion of the project by a specific date, within a fixed period after the occurrence of some event such as the delivery of a replacement mainframe, or for a fixed price. Without question, a conversion project will deserve the "turnkey" label if the conversion service supplier has complete or ultimate responsibility for its completion and makes a fixed price or deadline commitment, or promises to produce converted data or software that the user will find fully satisfactory according to the user's subjective criteria.

In both turnkey and joint-effort turnkey projects, the conversion service supplier assumes an express or implied obligation to absorb a cost overrun or the post-deadline expense of providing whatever service is required to complete the project. He may also expressly promise to pay liquidated damages for failure to meet a deadline; give the user a check securing his performance and run the risk of forfeiting it if a deadline is missed; or give the user a performance bond securing his performance, against which the user may file a claim if a deadline is missed.

Conversion service is offered by many types of businesses other than those specializing in conversion work and computer manufacturers. Software developers, consultants, and so called "system integrators" who specialize in providing total equipment and software solutions to computer users' data processing needs also offer the service. Generally, if conversion work is the principal business of the service supplier, he will be more willing to make a turnkey commitment than others offering conversion service. In large part this difference is attributable to the basic nature of the supplier's business. Whereas mainframe manufacturers, for example, are in the business of providing data processing equipment resources rather than results, conversion specialists are in a result-oriented service business.

Mainframe manufacturers differ in their reactions to turnkey demands. Some refuse to undertake the project, others agree, and still others propose a non-turnkey alternative consisting of a joint effort in which the user, or the user and the manufacturer together, identify the software and data to be converted and prepare the specifications. Both will then prepare the conversion plan and share responsibility for the work. The ultimate responsibility for completion of the project will be assumed by the user or shared by the parties.

Other conversion service suppliers will propose this joint-effort, non-turnkey solution to user conversion requirements if they share the manufacturers' dislike for complete responsibility and joint-effort turnkeys, or have the same workload and experience concerns. To help ensure its success, the supplier proposing this non-turnkey approach to the user's conversion work requirements should insist that each party

assign an identified, experienced and dedicated manager and staff to the project. The two staffs can work together or independently on project segments, but the conversion plan should specify the parties' responsibilities in each phase. Alternatively, the supplier might convert all of the data and software, and leave the user to finish the project by installing the revised material on the new mainframe. In this variation of the plan, the supplier is said to do the "raw" conversion and the user undertakes the "implementation" of the converted material on the new computer.

V. SOME PROBLEMS AND CONCERNS

A. THE PARTIES' CAPABILITIES

Computer users have legitimate concerns about the representations and estimates of conversion service suppliers. Some service suppliers purposely underestimate the time it will take to complete a conversion in order to underbid their competition and obtain the contract, and sales representatives for service suppliers sometimes misrepresent the supplier's capabilities. To protect against these abuses, users need the protection provided by an experienced counsel in negotiating a sound contract.

Mainframe manufacturers undertake a significant volume of conversion work and have legitimate concerns about the use of specific deadlines or a user's subjective criteria as milestones. These concerns are shared by other conversion service suppliers in varying degrees. Manufacturers and some other suppliers also share a concern about the personnel resources required by conversion projects.

To ensure their success, major conversion projects, and turnkey projects in particular, require the full-time commitment of several system analysts or programmers experienced in well-planned and managed conversion work. A manufacturer's analyst and programmer staff will be sufficient to counsel its marketing personnel, prepare analyses and studies of current and prospective customers' data processing needs, and provide software development and maintenance services. However, some portion, or perhaps most, of this general purpose technical staff will lack solid conversion experience. Because of its day-to-day workload, the staff will be hard pressed to provide significant conversion services to customers. While some mainframe manufacturers maintain a dedicated conversion staff, even this group will do an irregular volume of conversion work and the highly qualified personnel required for such work are frequently difficult to find on short notice. Hence, manufacturers will be reluctant or unable to hire additional programmers or analysts to work on some conversion projects. These workload and expertise concerns often make mainframe manufacturers and the occa-

sional conversion service supplier think twice before committing themselves to major conversion projects.

Large mainframe computer users have similar concerns. Their data processing staffs are always backlogged with work. Only the largest staffs can avoid a significant growth in this backlog when they dedicate one or more experienced employees to the task of drafting specifications, planning the conversion to the last detail, and working on the project. These users will have experienced data processing managers, analysts and programmers, but few, if any, will be conversion experts. As a result, it is natural for users to feel that turnkeys are attractive solutions to their conversion requirements.

B. MILESTONES AND RELATED PROBLEMS

Milestones, which mark the completion of jobs or work segments defined by the conversion plan, are a second extremely important element of an effective approach to conversion work. Without them, a plan for a large conversion project is, at best, a projected sequence of activity over an indefinite period.

When a mainframe computer user decides to undertake a large conversion he typically wants a replacement mainframe delivered and the conversion project completed within an acceptable, limited timeframe, rather than over an indefinite period, because he needs increased data processing capability in the near future. To ensure that the work will progress according to an acceptable schedule with a satisfactory completion date, the prudent user will insist upon milestones for each segment of the project, including a final milestone for its completion.

Milestones can be classified according to their subjective or objective nature. Objective milestones include specific dates, periods of time after the occurrence of an event such as execution of a contract or delivery of a new computer, and tests which each segment of converted material must pass before the segment is considered completed. Tests may qualify as either objective or subjective milestones depending upon the degree of subjective evaluation required to determine whether they show the successful completion of a work segment. Tests are seldom totally objective in nature, however. Examples of subjective milestones include the parties' mutual agreement that a work segment is completed; and the supplier's, user's, or an independent group's or arbitrator's opinion as to when work segments and the entire project are completed. The subjective opinion of a party to the conversion transaction is, at best, a milestone in name only.¹⁶

Both types of milestones can be combined in a conversion project

16. These objective and subjective examples are some of the most commonly used milestones, but are not an exhaustive list.

plan. For example, the plan may contain a specific date or period of time for project completion and leave completion of work segments open either to mutual agreement or to the subjective determination of one of the parties. This type of plan is not recommended.

Many users prefer the use of their subjective opinion as milestones because they believe it gives them complete control over the conversion project. They reason that their control will ensure the project's success. In fact, such milestones increase the likelihood of an unsatisfactory or unsuccessful conversion because they do not require planning, they are often not formulated or communicated in a timely fashion, and they are sometimes misunderstood or perceived as being unreasonable when they are expressed.¹⁷

In contrast, the use of objective milestones forces the parties to establish a schedule against which they can measure progress toward the goal of project completion within an acceptable period. Once established in advance, objective milestones clearly signal the immediate need for corrective action when they are missed, leaving no room for failures to communicate, misunderstandings or arguments over whether they are reasonable.

Moreover, when subjective milestones are employed, users commonly delay the conversion by changing their mind about the project's definition and the quality of the work product they require. User personnel may disagree among themselves over the question of whether a work segment has been satisfactorily completed, and thereby further delay the project. In short, subjective milestones are not in the user's best interest despite the control they allow over the conversion project.

C. ADDITIONAL PROBLEMS AND CONCERNS

1. *Cost Overruns*

The aspects of conversions that most concern service suppliers are those that create the possibility of a cost overrun, such as subjective milestones. Virtually every conversion service supplier has suffered through a project with significant cost overruns. If the project plan does not specify objective criteria by which both parties can determine when work segments and the total project are to be completed, the user will typically make the determinations, leaving the supplier at the mercy of the user's subjective opinion as to what constitutes an acceptable finished segment or project. The supplier is also at the mercy of

17. When subjective milestones are used, the computer user seldom decides what will satisfy him in advance. He seldom explains what will satisfy him until something unsatisfactory is discovered. His explanation is sometimes unclear, and his desire is sometimes unreasonable. Further, the parties seldom prepare a clear, feasible work schedule in advance.

others when such third-party decision makers as arbitrators or blue-ribbon panels decide when the work is satisfactorily completed. Either a user or a third-party decision against the supplier can result in the loss of all profit anticipated on the project and severe cost overruns which could decimate the supplier's treasury.

Specific date or fixed event milestones can also lead to cost overruns. Since users set or give input toward the determination of the dates or events, these milestones help them control the conversion project and also provide clear standards by which its progress may be measured. If the project falls behind schedule, additional manpower may be assigned and the plan can be reevaluated or the service supplier can be replaced. By their very nature such milestones help to ensure timely completion of a project in which time is of the essence. However, while these objective criteria are preferable to subjective milestones, prudent conversion service suppliers will be reluctant to accept responsibility for satisfying them without additional safeguards such as tests and specifying the users' responsibilities because circumstances beyond the suppliers' control can cause these deadlines to be missed. For example, such deadlines in joint-effort or shared-responsibility conversions can only be met if both parties' personnel are experienced and competent. A lack of competence by user personnel assigned to the project might become apparent only after the project begins and make the deadlines impossible to meet.

2. *Changes*

After the conversion begins, users frequently add new software or data to the specifications and expect them to be converted along with the originally specified software or data by the original project deadline. The additional work, even if small in volume, often throws the project off schedule. Even more common is the request to improve software identified for conversion. As noted earlier, such improvement requests made after the project begins are one means by which the user contributes to its failure. Users requesting improvements in software earmarked for, or undergoing, conversion invariably want the project to proceed on schedule. They usually underestimate, however, the time required to make the improvements and have little idea of the changes necessitated in other portions of the software, or in other software packages, by one improvement in a single software package. Prudent suppliers of conversion services with a specific date or timeframe deadline will refuse to make improvements in software about to be converted until after the project is completed, or will insist upon revising or eliminating the deadline.

3. *Event-Driven Plans*

Circumstances beyond the supplier's control can also prevent him from meeting deadlines in an event-driven plan where the only event is execution of a contract, or the delivery or operation of a new computer, or where the work segments must be completed within fixed periods thereafter. While conversion specialists and several other kinds of suppliers will undertake a conversion with such a "one-event plan," many suppliers counterpropose an "open-ended, sequential-event plan." The typical open-ended, sequential-event plan also focuses on an initial event such as execution or acceptance of a contract, or the delivery or operation of a new computer. Rather than fixing work segment deadlines after the initial event, this plan arranges the work segments in sequence, requires work to commence on each segment only after the previous segment has been completed, and permits the project to be completed whenever the last segment is finished. Although this plan works well for small conversion projects requiring less than one thousand hours of labor, it is seldom satisfactory for a large project.

4. *Tests*

Many consultants recommend the use of tests as milestones. New data files created by the conversion work can be tested by visually comparing the words and figures on data reports produced by the old and new mainframes. A better procedure, however, is to buy or create a file comparison program to test the new data files to determine whether all data is copied and converted correctly.

Converted application software can be tested in several ways. A few examples of such tests include placing the converted software in productive use, conducting a comprehensive comparison of output from the converted software with output generated by the original programs operating on the old computer, and using test files. Many users prefer to test converted software before it is placed in productive use because they recognize that an untested program is a potentially defective program that could cause the loss of processing time and data. From a practical stand point, a user involved in a large application software conversion rarely has the time, manpower or budget to conduct a comprehensive output comparison, or any other kind of exhaustive test, before the software is placed in productive use. Consequently, the use of test files is a popular method of verifying the capability of converted application software.¹⁸

18. Another approach would be to keep the old mainframe for some time after the conversion is completed solely for the purpose of testing the converted data and software. If the old mainframe, data and software were operated simultaneously with the new computer and converted data and software, periodic or ongoing comparisons of reports and

For test files the user could select a number of important records and reports produced by some or all of the application software packages that will be converted. Some users will be reluctant to use their records or reports as test files because the information they contain is sensitive or confidential and the service supplier's personnel will have access to the files during the project. A nondisclosure agreement signed by the service supplier, and perhaps accompanied by individual agreements with its project personnel, will sometimes alleviate this concern.

Another alternative for such users is to prepare hypothetical data identical in nature to the actual data appearing in the selected reports and records, and then run the data through the old mainframe to produce hypothetical reports and records that will serve as test files. Regardless of whether real or hypothetical reports and records are used as test files, if the converted application software operating on the new mainframe can duplicate them, then their conversion would be regarded as successful.¹⁹

This testing procedure has several weaknesses. If test files are not selected or developed for all converted application packages, some will be placed in productive use without prior testing. They may or may not be defective, but if they are, the untested programs may cause costly problems which may not be discovered for some time. Also, because test files test only a portion of any converted package, many errors could exist in the untested portions which could cause costly problems that escape detection for some time. A more subtle weakness stems from the fact that application software is rarely, if ever, converted perfectly the first time. There will virtually always be differences between the appearance or operation or output of the converted application package and the original package. Someone has to determine whether these differences are minor enough to ignore or should be corrected. This is why tests are never totally objective milestones. Subjective evaluations of test results cannot be completely avoided and they sometimes give rise to disputes. However, if the important reports and records generated by each major package that is converted are satisfactorily reproduced on the new mainframe, the user can reasonably anticipate that only minor problems, if any, will be found in the untested areas or

records would disclose errors in the converted data and software. Of course, this approach can be combined with a test procedure during the conversion. Regardless of the manner in which the computer user tests his converted data or software, he must be careful to test them as they will exist at the end of his fiscal year when large volumes of data and annual accounting jobs are processed.

19. Several copies of each test file should be made and set aside as insurance against their destruction, since one of the tests for each converted software program should be whether the test file for that program can be destroyed through recreation of common inadvertent errors and misuse.

packages. Hence, this partial test procedure seems to be a reasonable and practical approach to determining when project phases have been completed and when corrective action is needed.

Some analysts and programmers feel that creating and using test files is unproductive. They believe an application program they have converted will operate effectively on a new mainframe whether or not it is a perfect duplicate of the original version that ran well on the old mainframe. This is a naive belief; equipment differences and other factors commonly prevent precisely converted programs from working well on a new mainframe. Sophisticated users realize that creating and using test files in a large application conversion project is important to a successful conversion.

Overall, test files for converted software and data are good conversion control tools for the user and assist both parties in keeping the project on schedule. Tests are effective milestones when the item compared with the test files is a perfect match or a poor comparison. The comparisons usually lie somewhere in between, leaving the door open to subjective evaluations and disagreements. Whenever tests are adopted as milestones the parties should agree upon objective criteria or reasonableness standards applicable to the evaluation of the test file and test item comparisons in order to eliminate as much subjectivity as possible from the evaluation.

VI. OTHER ELEMENTS OF AN EFFECTIVE CONVERSION

Other important elements of a good conversion approach include the use of additional software such as a file diagnosis program, which must be created and employed in order to ensure a successful project. In addition, the user must carefully assess his everyday workload and the personality of his technical staff before defining the project's speed so as not to set an impossible pace.

Another important consideration is the service supplier's fee. Sophisticated users will insist upon an incremental payment schedule keyed to completion of each major phase or milestone with the final payment due after the project is completed. By itself, this payment arrangement gives the user a great deal of control over the project and encourages the supplier to provide acceptable service.

Finally, the user should insist upon a tailor-made contract for his large conversion project. The contract should incorporate any RFI or RFP issued and the supplier's responses, along with any survey furnished by the supplier and the parties' correspondence pertaining to the project. It should contain the data and software specifications and conversion plan with milestones, plus an implementation plan with milestones if the supplier is involved with installing or implementing the

converted data and software on the new mainframe. The incremental payment schedule mentioned above is a very important feature of a good conversion contract. A procedure for error correction should also be included in the agreement. Project managers should be required to coordinate activities and frequent progress meetings should be prescribed.

Consideration should also be given to a liquidated damages provision triggered by the failure to meet a milestone. A performance bond may be used in lieu of, or in addition to, a liquidated damages clause. Of course a warranty provision must be included in addition to the error correction procedure. The contract should also address the protection of both the user's and supplier's trade secrets, which is often one of the most sensitive topics to be negotiated. Another sensitive topic is the limitation of liability and remedy provision. Counsel for both sides should approach this important provision as they normally would in the context of a multimillion dollar transaction that may or may not have been misrepresented by the supplier, and that could produce a multimillion dollar lawsuit if things go wrong.

CONCLUSION

A large conversion project is more susceptible to failure than most business transactions. If the conversion does fail, the user may suffer the loss of his software and the destruction of his data, which in turn may destroy his business. If the conversion produces usable but unsatisfactory data or software, the user typically either accepts them, expends considerable funds to correct them, persuades the service supplier to correct them at no additional charge, or shares the correction cost with the supplier. In any event, his business is disrupted.

While users commonly fall victim to supplier misrepresentations, underestimates, or poor performance, suppliers are concerned about excessive cost overruns and large damage awards which can substantially deplete their treasuries. Suppliers also fear negative publicity from dissatisfied customers because it often makes acquiring and doing business more difficult.

Because of these risks, both the buyer and seller of conversion services must exercise precaution when entering into conversion transactions. These risks can be minimized, but not completely eliminated, through the steps outlined in this Article. The use of experts in all phases of the conversion project is highly recommended and further minimizes these risks. Conversions cannot be made totally risk free for either party, but they can be structured and conducted so as to maximize the likelihood of their success.

