A PRACTICAL FEASIBILITY STUDY FOR ELECTRONIC DATA PROCESSING *

by

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Presented to the Fire
Underwriters Association of the Pacific

*Acknowledgment is made to Stanford L. Optner, Member of the Technical Staff, Computer Systems Division, The Ramo-Wooldridge Corporation, for his contribution in preparing this paper.

A PRACTICAL FEASIBILITY STUDY

FOR

ELECTRONIC DATA PROCESSING

I am delighted to be here today to talk to you about electronic data processing. I'm sure there is no subject your chairman could have chosen that has more current interest or that will, eventually, have a greater effect on the operations of American business.

The interest of businessmen in this subject is another indication of a great source of strength in our society--the willingness, even eagerness, of the American businessman to investigate new and better ways of doing his job. It is interesting to note that the first, large electronic computer was completed at the University of Pennsylvania at the close of World War II. This machine, the ENIAC, was the forerunner of all the machines which are now the hearts and brains, of electronic data processing systems.

Today there are over 600 electronic data processing machines in use by business. Seventy-five of these are the large-scale variety, such as Remington-Rand's UNIVAC, the IBM 700 series, the Datamatic 1000, and the RCA BIZMAC--each representing an investment of $1,000,000.00 or more. It is evident that businessmen have been active in applying computers to business problems.

Some day most of the companies represented here will be using electronic data processing equipment. The question, of course, is--when?

The answer to this question lies within each company. And that answer is--when the benefits of an electronic data processing system offset the cost of the installation.

I would like to devote my talk today to this subject: What a company can do to determine the possibility of using electronic data processing equipment, in its own operations. A systematic program for a company investigating electronic systems can be characterized by two major efforts.

The first is a planned educational program designed to alert management and operating personnel to the possibilities of electronic equipment, as it applies to their particular areas of responsibility. The study of electronic data processing systems is complex and can be bewildering. The education program should be tailored to the needs of those it is intended to reach. It is reasonable to assume that the program for top management would concentrate on the costs and the management benefits such as greater control of operations, increased accuracy and currency of records. Operating personnel will be more interested in the actual changes in operational procedures, the equipment will make possible.

The importance of the first part of the program cannot be overstated. It is during this educational phase that insurance men, let us say, and computer men, achieve a mutual understanding of each others' aims, without which a successful system could not be realized. You will get a clearer idea of some of the specific possibilities of electronic data processing systems if I concentrate on the second major effort of the company program--that of determining in detail how electronic data processing can be applied to your company's problems. An investigation of this type is usually called a "feasibility study".

The Feasibility Study

In conducting a feasibility study a company has the option of two methods. The first might be called the analytical method. Using this method, a company recognizes the need to study in detail the functional possibilities of electronic data processing, and assesses the operational and economic advantage and disadvantages of an electronic system. This method further recognizes the need to evaluate the electronic program with expert, professionally trained engineers, either from within the company, or hired as consultants from the outside.

Another method might be termed empirical because the company that uses it, is relying heavily upon their own systems experience to evaluate proposals from many computer manufacturers. The empirical method has the advantage of saving the money required to conduct a feasibility study, and may possibly reduce the elapsed time before the equipment is installed and operating.

The advantage of the first method is that the company has real assurance that it has explored the full possibilities of electronic data processing and has selected the best system for its needs. They have the added assurance that their installation has been scientifically planned prior to the selection of equipment, and there is a rational basis for predicting cost, operational and management advantages of the proposed mechanization.

As an example, the feasibility study might show it to be advantageous to consolidate inventory control with accounting and production control, as indeed it did in a study undertaken by The Ramo-Wooldridge Corporation for an industrial client. This paper, in fact, is a report of the methods used in an actual study undertaken for one of America's largest corporations.

The objectives of the feasibility study are to determine if, how and where automatic data processing can be used to advantage in a company's operations. The feasibility study must contain four major elements:

1. The economic study--to determine what cost elements will prevail in assuming the financial burden of a computer;
2. The operational study--which machine best fits the over-all needs of the company?
3. The priority study--to determine where the payoff is largest and most immediate for the client, and therefore, which jobs should be put on the computer first.
4. Finally a very heavy emphasis on the integration study--to minimize the time the computer will need to do the assigned work load, by relating intimately the source documents and reports required for management control.

The most effective way to embark on a feasibility study in your own company is to set up an executive steering committee whose function is to supervise and steer the efforts of the men who will actually make the feasibility study. The steering committee should include members of top management, and be representative of the major departments of the company.

The team of workers who make the feasibility study should include company personnel and qualified consultants who specialize in electronic data processing. The probable make-up of such a group would be men from middle management levels representing the departments where the operational changes might be expected to be the greatest--such as the tabulating department, systems and procedures groups, and accounting and production control.

The company members of the team should be assigned to work full time with the non-company personnel, who would be mathematicians and engineers with specialities in business analysis, operations research and electronic data processing systems.

Six Steps in the Feasibility Study

The program of the feasibility study team can be divided into six steps, from its first look into the subject of electronic data processing until equipment is on order.

Chart I

Education

The first step is the education phase. The feasibility team should begin with a systematic study of available material on electronic data processing, that applies to the project being undertaken.

One of the important sources of education is to be found in manufacturers' courses, both of the executive orientation type and the detailed programming type. In addition there are the professional society conferences dealing with automatic data processing and computers. Many of these conferences include exhibits where the individual pieces of equipment may be seen in operation and the manufacturers' personnel are available to answer inquiries. There is also a vast supply of literature available on existing or planned equipment, installations and applications.

HOW TO MAKE A
FEASIBILITY STUDY

EDUCATION

OVER-ALL SURVEY

DETAILED DESCRIPTION OF PRESENT OPERATIONS

POSTULATE A GENERAL ELECTRONIC SYSTEM

EQUIPMENT EVALUATION

CONCLUSIONS *and* RECOMMENDATIONS

CHART I

Survey of Application Areas

The second step is an over-all survey of the companys' operations. This should be a brief but critical examination of each area to be considered, in an attempt to arrive at a priority list based upon the need for mechanization and the susceptibility to mechanization.

Rough measures for determining the need might be the number of personnel involved and the cost of the present system. The susceptibility to mechanization depends upon the type of operation involved. Operations that are repetitive and performed on large volumes of data are particularly susceptible to successful mechanization, and frequently show the largest savings.

Another major objective of the over-all survey is to delineate specific integration possibilities among the various applications. Even at this early stage, it is possible to visualize how the various data processing tasks may be interrelated to achieve the most economic and effective operation of the computer.

Description of the Present System

The third step is a detailed description of the present operation. Many people say that the best way to conduct a feasibility study is to consider only the basic inputs and outputs based on an analysis of how the company functions. However, it has been our experience that a great deal more can be learned from an examination of present operations.

The reports or documents that are produced by a system are called the outputs. The source documents going into the system are called the inputs. The outputs and inputs must be ingeniously inter-related in order

to design an economic electronic system. But to try this without examining the present methods of operation, is to risk over-simplification, or the failure to include some of the essential processing required. In a detailed examination of the present operations, it is possible to detect the unnecessary duplications of operations or files that typically creep into data processing systems that have evolved without scientific control. Elimination of such duplication is one means of effecting savings in a new system. In any case, a detailed description of the present system is a good starting point because it indicates one method of performing the required data processing operations.

These are some of the ways to describe the present operations of a company:

Chart II

1. Flow charts--that illustrate the relationship of procedures or activities within departments or smaller groups of a company.
2. Samples of input and output forms and reports--to provide a basis for examining how well or how much the information being transmitted or processed, is being used, or is necessary.
3. Specification of the processing necessary to arrive at a required output from a given input--to assure that all fundamental steps necessary to the proper completion of a task, are going to be included in the design of a new electronic system.
4. A list of the files to be maintained--to assemble the data essential to the system; such as the number and size of records, or the average number of numeric and alphanumeric characters

WHAT IS CONTAINED IN THE
DETAILED DESCRIPTION

FLOW CHARTS

INPUT AND OUTPUT FORMS AND REPORTS

PROCESSING REQUIRED

FILES MAINTAINED

ACTIVITY AND OTHER VOLUME FIGURES

COMMUNICATIONS REQUIRED

COST OF THE PRESENT SYSTEM

that comprise any individual record--for in electronic data processing, numeric quantities can be stored in less space than alphanumeric quantities. Another aspect of files which must be specified, is the access requirement. That is--how may times, over what period, is it necessary to refer to a file? In what sequences do the references take place?

5. In addition, there must be a specification of the activity and other pertinent volume figures. For example, how many orders are there per day, or how many receipts? Again we must specify both the average and the maximum. In many cases, it is useful to make a distribution of the activity which specifies the frequency of occurrence.

6. Any special communications, such as teletype between plants or departments must also be specified.

7. A reliable estimate of the cost of the present system must be determined. The cost analysis must include personnel, equipment and overhead charges.

Postulation of Generalized EDPS

The fourth step in our feasibility study is a postulation of a generalized electronic data processing system to handle each of the specific applications. The first step in postulating a system is to prepare an operational flow chart showing how data will be processed. It must detail the information flow from document creation to file maintenance and report preparation.

Chart III

OPERATIONAL Flow CHART FOR
PAYROLL PROCESSING

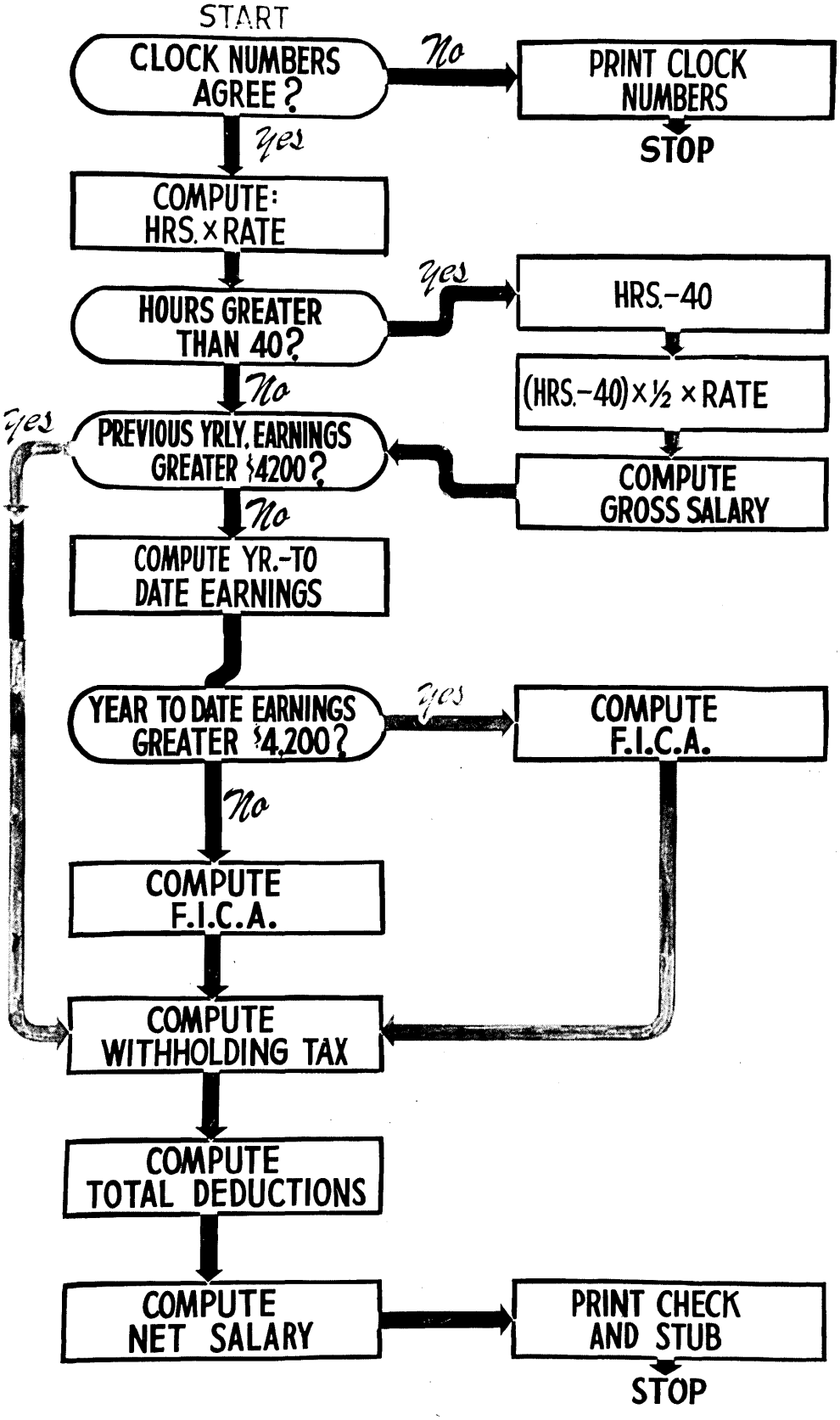


CHART III

Here is an example of an operational flow chart for a payroll application. With electronic data processing equipment in mind, such operational flow charts are reduced to "unit run diagrams", which represent very basic, elemental operations. Instead of showing how a system could be mechanized in terms of specific equipment, by using unit run diagrams, a generalized system can be postulated that is capable of mechanization more or less efficiently, on any data processing equipment. It is not intended that final mechanization will be restricted to these unit runs as you will see in a moment.

Chart IV

Notice this example of a unit run. In this case, an "employee master file" one of 10,000 records accommodating 10,000 employees, will be updated by a "master file adjustment" tape containing 1,000 records. I have shown these files as magnetic tapes because most of the electronic equipment today uses magnetic tape for input files. These 1,000 records which are going to update the 10,000 employee master records for various adjustments in a given pay period, can be put in from cards or might be converted on an "off-line" basis from cards to tape. This chart illustrates how to update the employee master file for additions of new employees, for deletions, terminations and transfers. It also shows how to update the year-to-date adjustments and employee authorized deductions, all of which must be maintained in the master file.

Equipment Evaluation

With these basic tools, the operational flow charts, the unit run diagrams and the Input, File and Output Specification Sheets, that correlate our information, we now proceed to the fifth step--a specific evaluation of individual equipment to determine which computer is best for this particular data processing application.

EXAMPLE OF A UNIT RUN

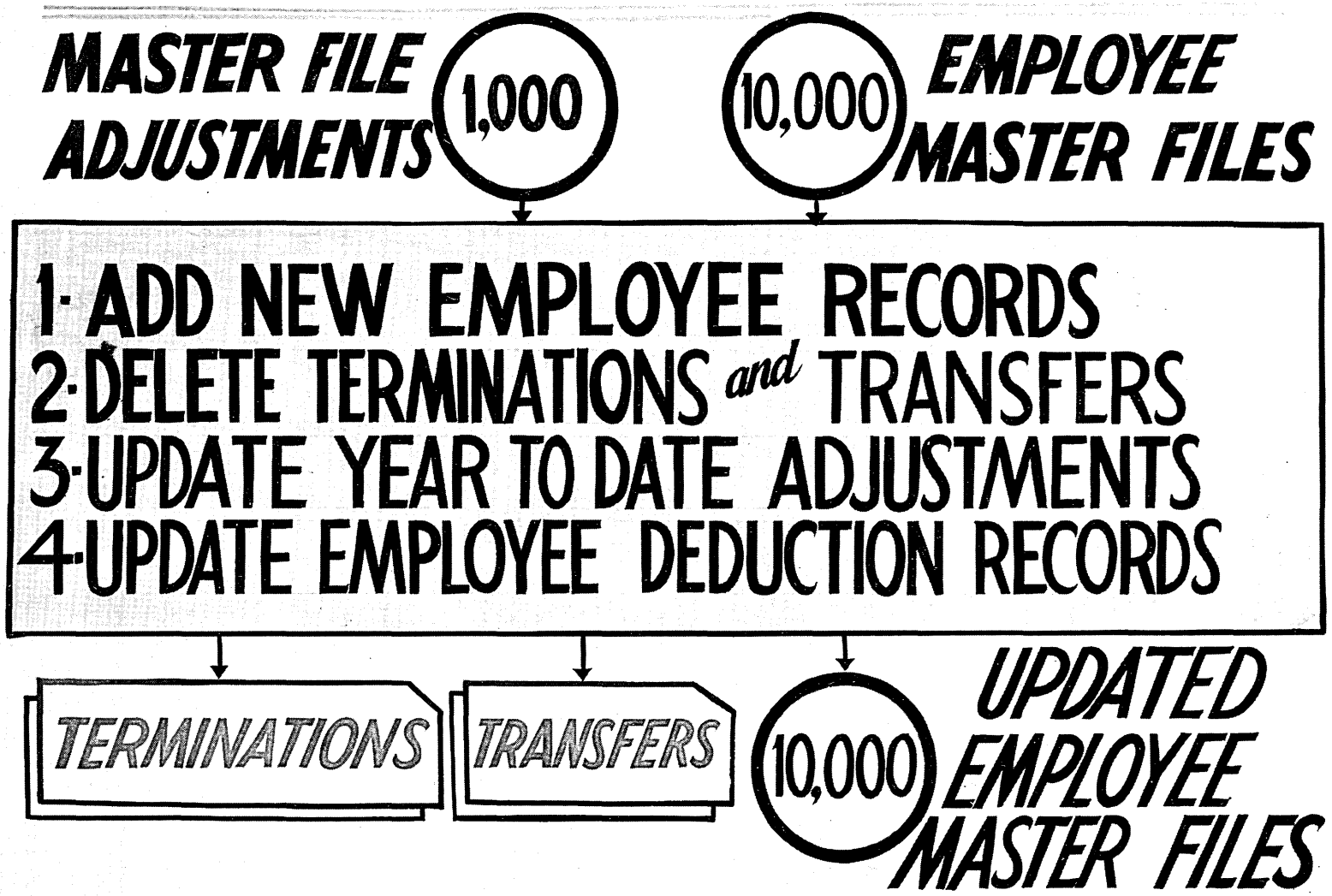


CHART IV

Chart V

These tools provide a framework within which to evaluate the specific data processing equipment.

The individual unit runs can now be combined in an optimum fashion for each particular manufacturer's equipment.

Chart VI

Notice the organization of a combined run on the payroll application which would include the original updating operations. You can see the current pay period adjustments affect only the present pay period, where the master file adjustments affect all future pay periods. Both of these adjustment records are inputs, to be processed with the time cards to show the hours expended in the current week. If there are 600 cards for current pay period adjustments, 1,000 records for master file adjustments, and 10,000 time cards, one for each employee--and 10,000 records in the employee master file, not only can adjustments be processed for both the current pay and the master file, but also the payroll can be computed from the time cards with the rates that are stored in the master file. The processing for payroll is similar to that shown in the operational flow chart. The outputs include terminations and transfers, and a tape that can be printed on an off-line device for the employees' checks and stub data. Another output is the updated employee master file.

When these combined runs have been prepared for a specific computer, the consultant responsible for a particular manufacturer's equipment prepares a list of hardware required. For this Ramo-Wooldridge client,

WHAT EQUIPMENT IS AVAILABLE?

LARGE SCALE	MEDIUM SCALE	SMALL SCALE
IBM 702, 705	IBM 650	BURROUGHS E-101
UNIVAC I, II	UNIVAC FILE COMPUTER	UNDERWOOD ELECOM-50
BIZMAC I, II	BURROUGHS DATATRON	
DATAMATIC 1000	UNDERWOOD ELECOM-125	

CHART V

EXAMPLE OF A COMBINED RUN

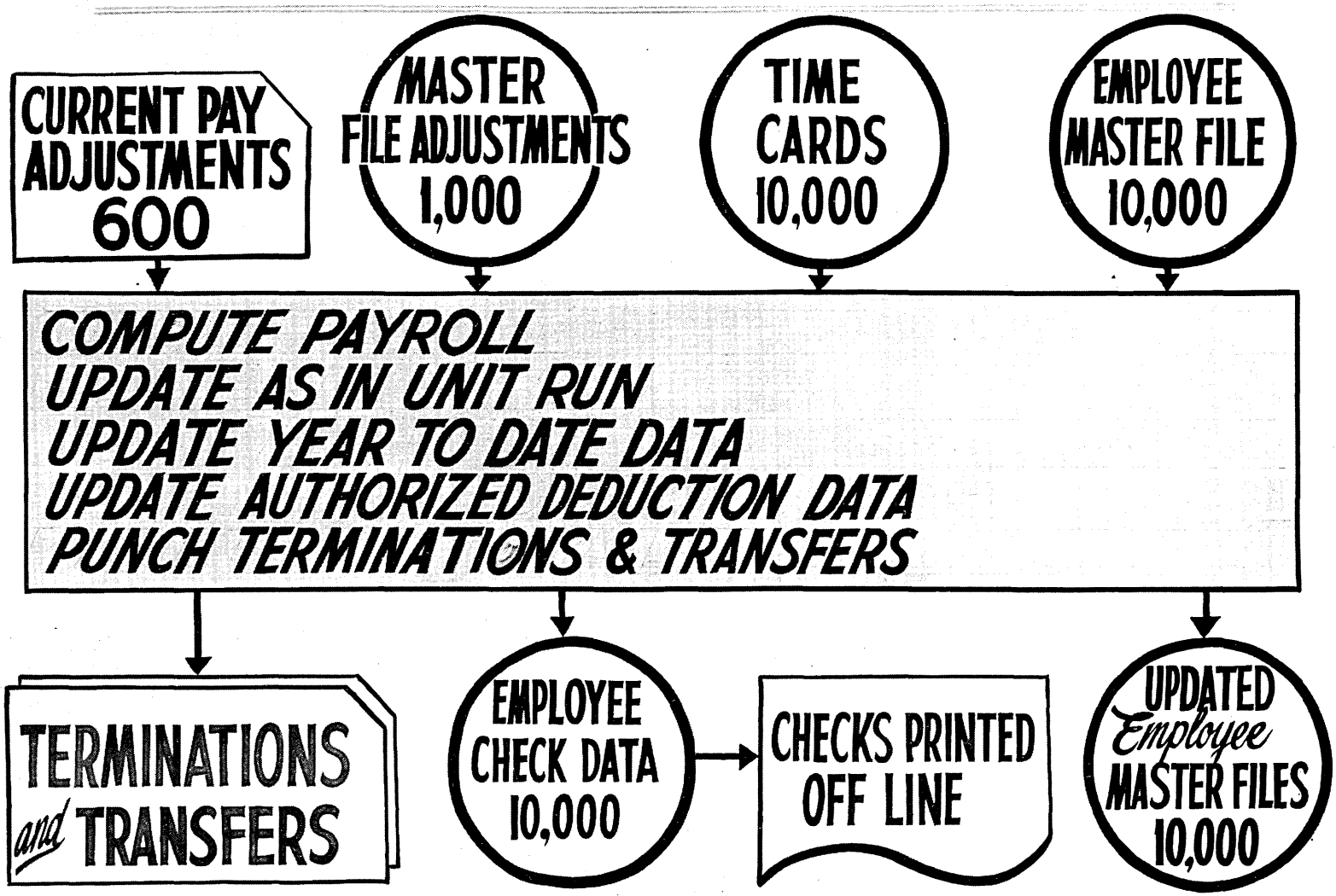


CHART VI

several of our specialists performed the equipment evaluation, since each consultant must be an expert on two or three machines. Computer manufacturers will list the required equipment for a data processing system, designating which pieces of equipment should be used for specific applications, but not for others. In this way, the computer manufacturer tailor-makes his equipment for a specific situation.

The consultant now determines running time on each manufacturer's equipment to see if his client needs a single shift, two shift or three shift operation. Then he will lay out these running times for the daily, weekly, or monthly runs, to indicate how they will be processed on a 24 hour basis. The total running time may not equal the number of shifts or elapsed hours required because it may not be possible to utilize the equipment full time. Before some runs can be performed, it may be necessary to do off-line processing resulting in idle time on the machine.

Now the consultant must determine the cost of the proposed system by adding up the individual equipment costs on either a rental or a purchase basis. If the equipment is to be used only for a single application, he will not pro-rate. However, if it is to be integrated with other applications, he will assess the cost of the data processing in a single application and pro-rate the time it takes as a fraction of a full shift, multiplying the total rental by this ratio. Personnel dollars for operating, programming and systems work must also be included to determine the cost of the proposed system. The individual, specific, operational advantages of the computer being evaluated will then be listed, to simplify consideration of the proposed data processing system.

Recommendations and Conclusions

By examining the individual equipment evaluations based upon the common postulated system, it will be possible for the consultant to perform the sixth and last step in our feasibility study, to make conclusions and recommendations. At the outset, it is necessary to determine whether or not electronic data processing is advisable at all for this particular client. If it is, he must outline the recommended system, based upon the individual equipment evaluations. The recommendation must include an operational, as well as an economic comparison.

The economic evaluation is a comparison of the displaceable cost of the present system with the cost of the proposed electronic system. There must also be careful consideration of the so called "intangible" benefits--more rapid reporting, more accurate information, and more sophisticated statistics and reports that can be prepared--these will all have a tangible benefit, to which a dollar value can be ascribed. In many cases it is very difficult to do this, so it must be recognized that such a dollar value will only be an approximation.

If the displaceable costs are greater than the cost of the proposed system, the intangible benefits could be considered "gravy". However, if the displaceable costs are approximately equal to, or even less than, the costs of the mechanized system, it might still be wise decision to install the electronic equipment, based upon better reporting and the other intangible benefits. In this case, the intangibles must be examined with considerable care to determine their reliability.

It is necessary to point out that the trend in the cost of a manual or semi-automatic system is constantly increasing per unit operation. With the electronic system, an increased burden would mean simply more time

on the equipment, or at some point, more equipment. Even if this were the case, the increase in cost per unit operation would be substantially less than the corresponding increase in a manual or semi-automatic system.

Before going ahead, I would like to recap where we have been, and then indicate where we are going. So far, you have heard how a company can begin the process of acquiring a computer, the alternatives of taking the analytical approach or the empirical approach, indicating the one which is preferred. Then we reviewed the objectives of the feasibility study pointing out the four important factors to be carefully weighed and analyzed: the economic, operational, priority, and integration capabilities. The major steps in the feasibility study were outlined next, starting with education, proceeding to the over-all survey and the method of making a detailed description of the present operation. Finally, you heard how the generalized electronic system is postulated, how the equipment evaluation takes place and how conclusions and recommendations are rendered.

Now we can proceed to some of the specific pieces of equipment that were considered in the equipment evaluation for The Ramo-Wooldridge client. You will see some of the things the electronics consultant looks for in the process of making an equipment evaluation, as we go along.

Equipment Considerations

The electronic data processing systems available commercially today can be divided into three categories: large scale--for those that sell for more than $1,000,000.00 or the equivalent rental; medium scale--for those in the approximate price range of $150,000.00 to $1,000,000.00; and small

scale--costing less than $150,000.00. It is not very significant to put equipment in these categories except to make cost comparisons, because there are many profound differences between the individual machines in any one category. A few years ago this was not so true. Computers were more similar than unlike. Today, however, there are many important and significantly different features in electronic equipment.

Chart VII

Large scale equipment available today includes the IBM 702 and 705, the UNIVAC I and II manufactured by the Remington Rand Division of Sperry-Rand, the DATAmatic 1,000 produced by the DATAmatic Corporation, a product of Minneapolis Honeywell and Raytheon, and the RCA BIZMAC I and their recently announced BIZMAC II. The more important commercially available medium scale machines include the IBM 650 with RAMAC, which provides random access to millions of decimal digits in a disc storage unit, the Burroughs Electrodata Division Datatron, the Underwood Corporation Elecom 125 and the Remington-Rand UNIVAC File Computer. Small scale equipment should not be considered for electronic data processing systems of any size because of their limited input and output facilities. Included in this category are the Burroughs E101 and the Underwood Elecom 50 which are desk size computers operated mainly from a keyboard, but with the capabilities of reading punched paper tape as input. The important differences in equipment are accented by the following characteristics: storage or memory capacity, the speed of operations, the input-output equipment and the off-line facilities.

An important consideration in determining whether a large scale or medium scale machine is more appropriate, is to determine whether

STEPS IN THE
EQUIPMENT EVALUATION

- COMBINE OR ELIMINATE UNIT RUNS
- DETERMINE SPECIFIC COMPLEMENT OF EQUIPMENT
- DETERMINE RUNNING TIME
- LAYOUT RUNNING TIMES FOR DAILY WEEKLY AND MONTHLY RUNS
- DETERMINE COST OF PROPOSED SYSTEM
- SPECIFY OPERATIONAL ADVANTAGES

the equipment is to be used for a single application, or for several. The large scale computers have more flexibility and can be used for a wider range of applications, more effectively, than can the medium scale. If the equipment is to be used for multiple applications, each application can be pro-rated. The possibility of economically justifying a large scale computer is much greater if more than a single application is to be mechanized. Clearly, a single application could seldom utilize the capabilities of a large scale computer, and economically could probably only justify a medium scale device. In general, large scale computers are more economical per unit operation. Thus, if several applications were to be mechanized in a single, large scale system, the cost of each application on a pro-rated basis would probably be less than if a medium scale machine were to be used.

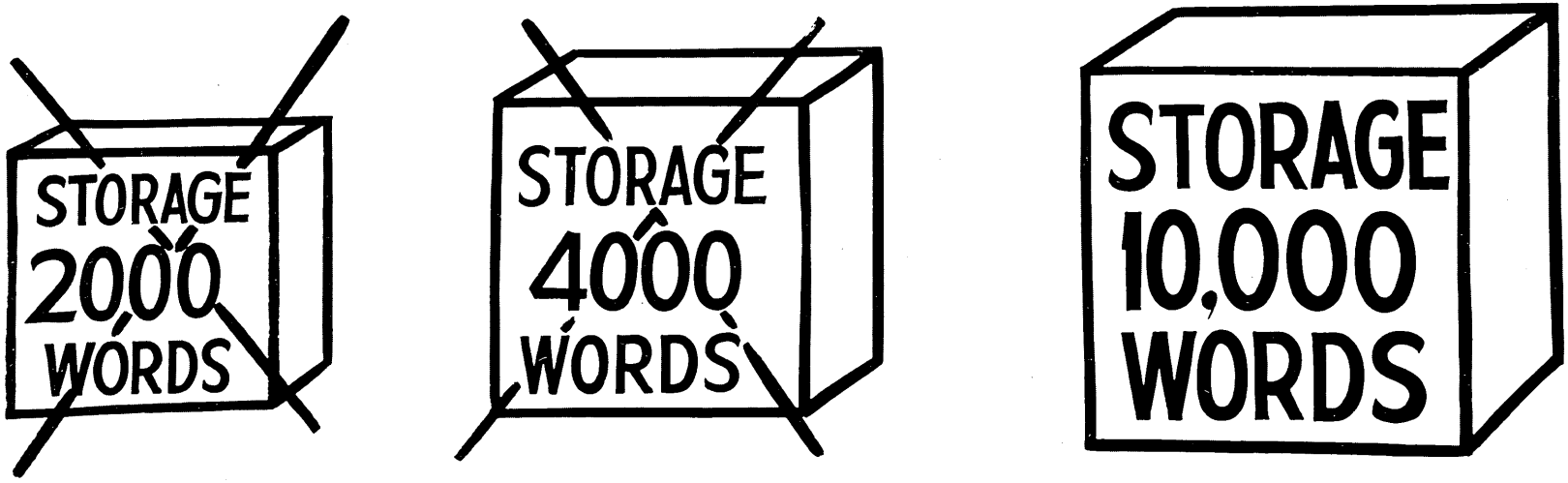
Insurance Examples

The particular equipment to be considered depends, of course, on the size and complexity of the application. Allow me to acknowledge the efforts of Messrs. Howard F. Worth of the Industrial Indemnity Company, John Emerson of the Hartford Accident and Indemnity Company, and Henry Sanguinetti of the Travelers Fire Insurance Company for the time they spent telling me about the data processing problems in fire, marine and casualty insurance. In the few hours we spent together, I was unable to hear nearly as much of this as I would like to know.

However, one of the applications which they described can be used to illustrate the importance of data processing equipment evaluations. In order to see this particular problem in context, consider how a fire insurance electronic data processing system could be used in a real situation. I will only assume that we have a sufficiently complex data

SELECTING PROPER EQUIPMENT

OCCUPANCY CLASSIFICATION		STRUCTURE TYPE		PROTECTION CATEGORIES
160	×	4	×	10 =6400



Problem: 6400 WORD STORAGE REQUIRED!

The 6,400 word requirement presents a problem that is characteristically solved during the equipment evaluation. For example, in the Electrodata Datatron there are only 4,000 words of memory available. In the IBM 650 only 2,000. However, if we use the Elecom, it is possible to obtain up to 10,000 words of internal memory. In this simple consideration, you can see how the characteristics of the equipment are very definitely a function of the particular application. This could be carried further to discuss the speed of table look-up. Table look-up depends upon the particular instruction list and the logical capabilities of the equipment selected. However, it becomes more involved than simply discussing storage capacity, which has served to illustrate the point.

It is important to obtain and accumulate the necessary statistics to prepare the required management reports. Electronic Systems makes it possible to prepare a much more sophisticated and timely report than under a manual or semi-automatic system. Among the more common statistics that must be accumulated, are loss ratios by each individual line of business, by the individual risk classifications and by agents, to determine each individual agent's performance.

There are two policies recently added to the portfolios of some insurance companies which could profit by having loss statistics more current. Current statistics would enable the insurance company to quickly assess the earning capabilities of these new policies. These policies are the Home Owner's Package Policy and the Commerical Block Policy. Forecasting techniques developed by Operations Research in combination with data processing "know-how" could solve this problem and make more significant information available for management.

It is also possible through the ultra high speed of electronic data processing to prepare loss ratio statistics on the basis of a policy year rather than a calendar year, and thus refer losses, that are always

reported with a time lag, back to the policy year which they effect. The computer is able to arrive at more accurate earnings for an insurance company, by considering only that portion of the premium which has been earned in the earned premium reports, and charging losses as soon as they are known.

A computer would make it possible to handle co-insurance and re-insurance data processing more easily. Today, this problem actually taxes the present data processing facilities of insurance companies to such an extent that in many cases, it is handled manually on an exception basis.

Efficient electronic data processing would also make it possible to reduce reserves for unearned premiums by making shorter period premium accounting attractive for the first time. With the electronic equipment available for data processing it is practical to collect premiums on a shorter period, for example, monthly or quarterly, and thus reduce the sum required for unearned premium reserve making more funds available for investment.

This morning we have seen how one phase of a typical insurance company's electronic data processing investigations might be performed. This phase was the feasibility study. You heard about the necessity for an education program, as an essential element in a company's data processing plans. We then reviewed how the feasibility study is performed outlining six important steps in conducting this study. These steps included education, the over-all survey, a detailed description of the present operations, a postulation of a generalized electronic data processing system, a specific equipment evaluation and finally the preparation of conclusions and recommendations. Finally, we spent a little time examining some of the specific equipment that might be involved in an equipment evaluation and reviewed a few specific problems by referring to fire insurance data processing in a very general way.

Let us now put the information from today's talk in focus. This can best be done by pointing out that there is a method by which reliable results are obtained in designing an electronic data processing system. At Ramo-Wooldridge we subscribe to the integrated systems concept. One of the important requirements of any integrated system is that it possess the property of updating itself. The updating property has been illustrated by reference to the problem of maintaining current information, in order to render better management decisions.

A further requirement of the integrated system is that it be under control at all times. Reference has been made to this problem by indicating some possible areas of improvement in data handling of the Home Owners Package Policy and the Commercial Block Policy.

A final requirement of the integrated system is that the inputs and outputs be used without duplication, in all areas of data processing. This type of activity has been outlined when we reviewed the role of the data processing specialist in designing an economic system.

I commend to you these principles and the high quality results they have achieved for others, and can achieve for you, in planning the electronic data processing system for your insurance company.