

CONDUCTING A FEASIBILITY STUDY
FOR
INVENTORY CONTROL APPLICATION

By
Neal J. Dean

The Ramo-Wooldridge Corporation

Presented to the American Management Association's Seminar,
"Applications of EDP Techniques to Production and Inventory Control"
on March 27, 1957, in New York, New York

CONDUCTING A FEASIBILITY STUDY
FOR
INVENTORY CONTROL APPLICATION

INTRODUCTION

Management's attitude toward the application of electronic data processing systems within their own company's operations seem to take four distinct alternative roads:

The first is to do nothing!

The second is to use punched cards for the simplest operations, and move gradually into more and more complex operations...until at long last, a timid one-for-one computer application is undertaken.

The third alternate road is to put a computer on order before the system is designed, then design the systems to be mechanized, and "get going"!

The fourth possibility is to conduct a study of the system requirements, and place an order for a computer after evaluating which one will best fill the needs of the company.

The first road I recommend only to ostrich lovers or a management whose small size positively precludes the possibility of using electronics in their business data processing. The second alternative is deceptively attractive. The possibility of gradually entering the electronic data processing field by getting more and more ambitious or more and more powerful equipment, is a comforting rationale. However, this is an illusory philosophy, since it leads only to a patchwork of nonintegrated mechanization islands. As each operation is mechanized, the bottleneck in the over-all company operations moves to another area.

If reporting is very late under a present system, to mechanize only a portion of the total without including all related areas, would result in information becoming available at different times. This would eliminate the possibility of obtaining integrated reports at a uniformly early date.

Consider a production control system which had electronically mechanized only the machine loading schedule without including raw material and work-in-process inventory, which was still maintained

on a manual or semi-automatic basis. It is clear that such a system would not operate properly since the basic inventory information necessary for computing machine load schedules would not be available on an up-to-date basis.

The important thing to remember about gradual mechanization is that it enforces the application of less powerful equipment. Tabulating equipment, or less ambitious electronic equipment, such as the punched card 650, can frequently be justified where the magnitude of the individual applications do not merit a larger electronic system. However, when the individual pieces are later put together, they will not fit, and total mechanization is not as efficient as if a data processing expert set out to design a completely integrated system.

The fact is that a fully integrated electronic data processing system cannot be obtained by putting together islands of mechanization. Systems must be planned in advance in sufficient detail to accomplish the required integration. Once the plan is completely designed, and the full economic and operational picture is available, management can begin to evaluate their data processing problems. With such an analysis, it is possible to see if some of the areas in the completely integrated system are independent. If so, they can be isolated and attacked separately. However, to mechanize islands without a complete master plan for integration is a costly, fruitless enterprise.

The third alternative is to select a computer and "get going"! With this approach the company starts the design of a detailed system using specific equipment with some possible time advantages. However, this method has inherent in it, the risk of selecting the wrong equipment! This is a fantastic gamble, since there are profound differences between individual electronic computers. The proper equipment for a single application can only be determined after some detailed study. Neither can it be said that a given set of equipment is best for all applications of a particular kind.

The stakes in this game of selecting a computer, are very high! Needless to say, the equipment itself is very costly, ranging up to 1.75 millions of dollars for large scale machines. But there is more!

It can cost more than a half million dollars to prepare for an electronic data processing installation in an average size integrated application. This includes the detailed design of the system, the writing of the programs, the "de-bugging," the conversion and the parallel operation. This large sum of money becomes even larger if later you find that more suitable equipment exists and it is necessary to convert. At its worst, conversion can mean costs of twice the order of the originally predicted expenditures.

This brings us to the fourth alternative which is to conduct a comprehensive study of the data processing requirements of an organization.

The name given to such an undertaking is a feasibility study. This is the subject of my talk, today.

In conducting a feasibility study, a company has an option of two methods. The first might be called the analytical method. Using this method, a company studies in detail the functional possibilities of electronic data processing in order to assess the operational and economic advantages and disadvantages of an electronic system.

Under the method, which might be termed empirical, the company solicits proposals from several computer manufacturers, for application of equipment to a specific system. It then selects one of the proposals on the basis of some criteria which it feels are adequate.

The advantage of the first method is that the company has the assurance that it has explored the full possibilities of electronic data processing and has selected the best system for its needs. This is especially true if the application has been scientifically planned prior to the selection of equipment. Then there is a rational basis for predicting cost and operational advantages of the proposed mechanization.

The empirical method theoretically minimizes the first costs of making ready to use a computer. It is further premised on the possibility of reducing the elapsed time before equipment is installed and operating. It is possible that both of these goals can be realized. However, the empirical approach is dangerous unless a company is sure of all the details of its application. To be sure, a company must be aware of the full possibilities of electronic data processing, as well as how continuing advances in electronic equipment will affect their costs and operational structures. Most companies are not in a position to make such a thorough evaluation, and would be best advised to conduct an analytical feasibility study.

CHART ONE

THE OBJECTIVES OF A FEASIBILITY STUDY

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 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.
2. 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 **BASIC OBJECTIVES** *of an* **INTEGRATED FEASIBILITY STUDY**

- ① *The PRIORITY STUDY*
- ② *The INTEGRATION STUDY*
- ③ *The ECONOMIC STUDY*
- ④ *The OPERATIONAL STUDY*

3. The economic study--to determine what the cost elements will be, before the company assumes the financial burden of a computer.
4. The operational study--to determine which machine's characteristics best fit the over-all needs of the client, and how the proposed system's operational capabilities compare with the present system.

CHART TWO

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.

EDUCATION

The first step is the education phase. The feasibility team should begin with a systematic study of available material 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 professional society conferences dealing with automatic data processing and computers. Many of these conferences include exhibits where individual pieces of equipment may be seen in operation and the manufacturers' personnel are available to answer questions. There is also a vast supply of literature available on existing or planned equipment, installations and applications.

SURVEY OF APPLICATION AREAS

The second step is an over-all survey of the company's operations. This should be a brief but critical examination of each area to be considered. In this way, it is possible 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.

CHART THREE

Here is an example of how integration in the inventory control area actually includes accounting, sales, inventory control and warehouse operations. Conceptually, this illustrates the intimate relationship of all aspects of data processing. Considerable analysis is necessary to bring the level of information to a point where these interrelationships can be established.

DESCRIPTION OF THE PRESENT SYSTEM

The third step is a detailed description of the present operation. One point of view is 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, the preponderance of evidence indicates that a great deal more can be learned from an examination of present operations.

The source documents going into the system are called the inputs. The reports or documents that are produced by a system are called the outputs. The outputs and inputs require integration 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 which 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 either case, a detailed description of the present system is a good starting point. The present system is important because it illustrates one more or less adequate way in which the firm's data has been processed.

CHART FOUR

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

1. Flow charts--which illustrate the relationship of procedures or activities within departments or smaller groups of the company.

SCOPE OF THE
INTEGRATED DATA PROCESSING STUDY

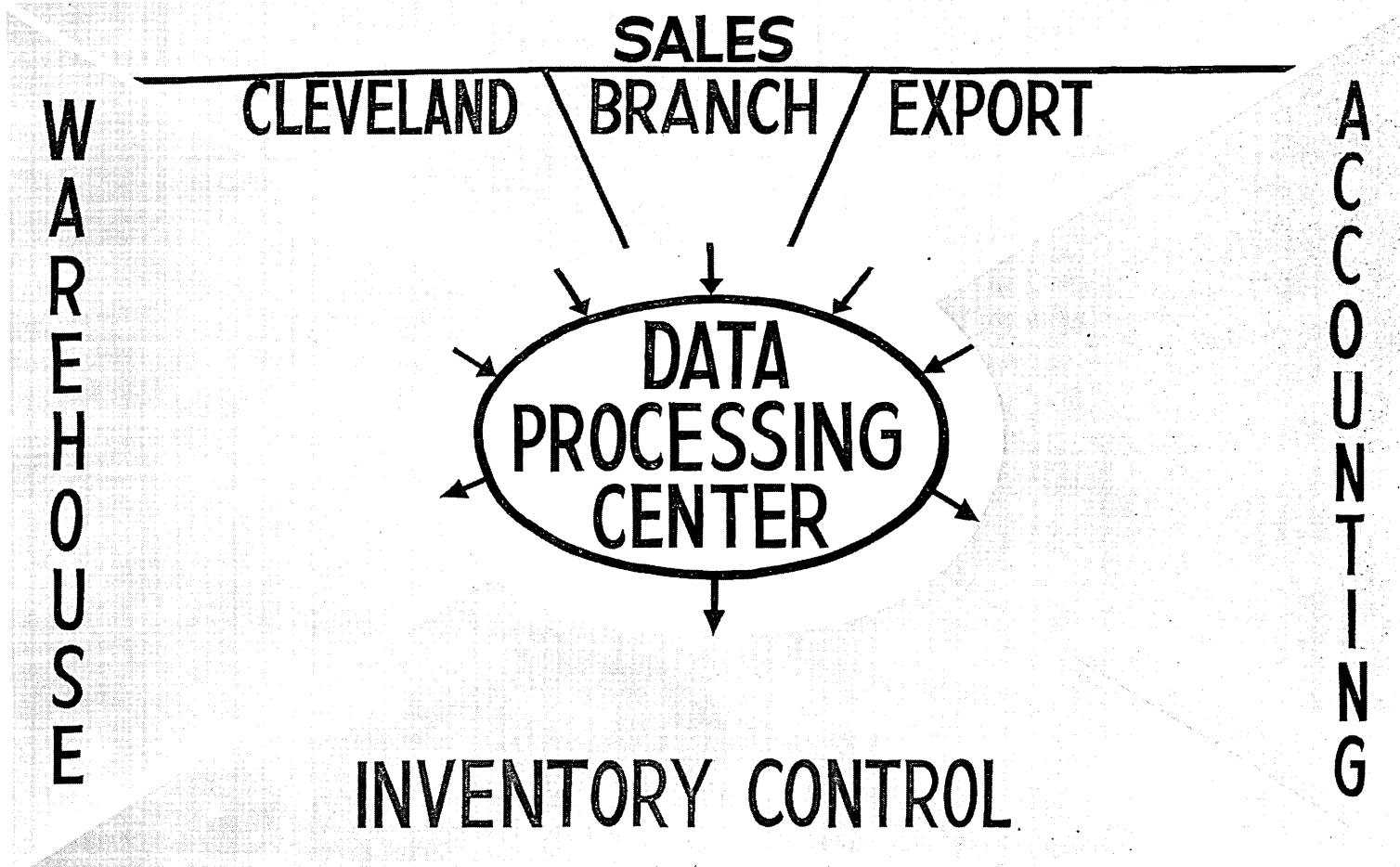


CHART III

***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

2. Samples of input and output forms and reports--to provide a basis for examining how well or how much of the information is being transmitted or processed.
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 the records, or the average number of numeric and alphanumeric characters that comprise any individual record. In electronic data processing, the type of information to be stored or processed is important because 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 many times, over what period, is it necessary to refer to a file? In what sequence 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 department 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 E D P S

The fourth step in our feasibility study is a postulation of a generalized electronic data processing system to handle the integrated system for 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. From such an operational flow chart we proceed to a specific integration chart, showing the various inputs and source documents, and the various outputs or reports in the respective organizational areas.

CHART FIVE

We take another step forward from the operational flow chart and the integration chart to the specifications of the unit runs. This novel approach, created by the data processing consultants of The Ramo-Wooldridge Corporation, was developed to reduce analysis time in complex data processing situations.

INTEGRATED DATA PROCESSING SYSTEM

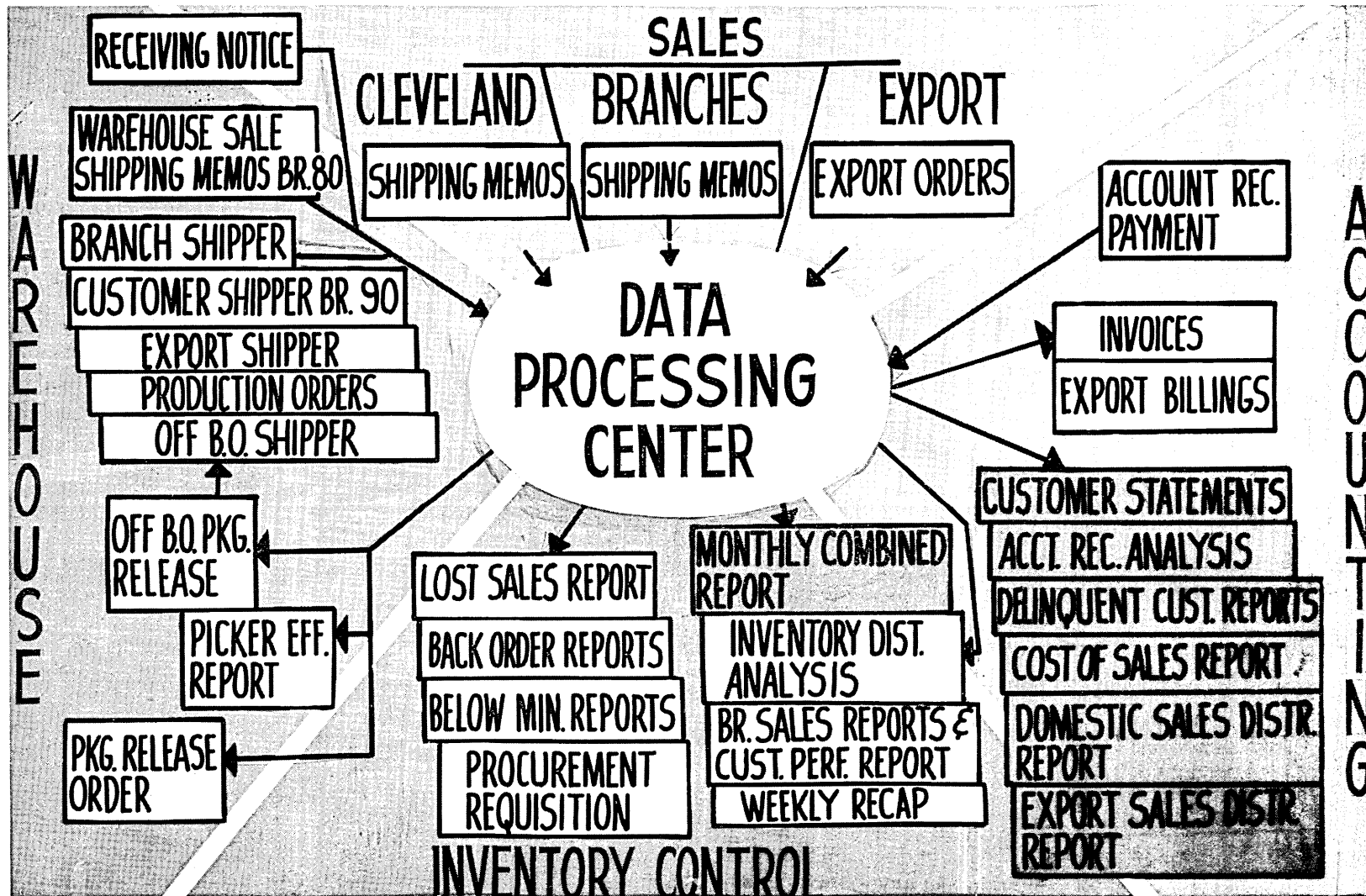


CHART V

If you were to attempt to evaluate commercially available equipment in the data processing field for a given application, you would normally have to design a different system for each computer. This would be necessary because there are profound differences in equipment and each one requires a significantly different system in order to optimally use a given selection of equipment. Therefore, the number of systems designed would have to be equal to the number of computers to be evaluated. However, the approach of the Ramo-Wooldridge management consultants was to design a generalized data processing system in terms of unit runs.

Unit runs are elemental pieces of data processing. These unit runs perform such a small amount of the data processing that they would seldom be actual machine runs. However, the individual unit runs can be combined into consolidated machine runs for any given equipment. In this way, actual machine runs can be quickly developed.

To illustrate our point, consider what unit runs were required for the integrated inventory control and accounting system for Thompson Products Replacement Parts Division.

CHART SIX

On this chart we see a list of some of these unit runs. A total of 56 in all were needed to completely describe the data processing required in this Division. Later you will hear more about our new technique of using unit runs when we combine them into consolidated machine runs, in the equipment evaluation phase.

What else is essential in order to specify a generalized electronic data processing system? In addition to the operational flow charts, the integration chart and the unit runs, we require information about the files, the input source documents and the output reports. This information must be compiled in an organized fashion, and entered onto specification sheets, which serve as an all purpose data accumulation record for files, inputs, and outputs. These specification sheets coordinate and reduce to a standard form the information contained either on the document or report, or maintained in the file, describing the number of characters or decimal digits on the individual items. The file of specification sheets which are accumulated in the course of a feasibility study, become the basic reference for all of the quantitative data essential to later phases of the study.

EQUIPMENT EVALUATIONS

CHART SEVEN

Having carefully described all of the unit runs, it now becomes necessary to combine these units for optimal operation on any one computer with the proper associated equipment. This process is known as equipment evaluation. At Ramo-Wooldridge, each manufacturer's computer and associated

UNIT RUNS

- *Enter* SHIPPING MEMO
- *Edit* SHIPPING MEMO
- 3 ■ *Sort* SHIPPING MEMO
- *Match* SHIPPING MEMO
- 5 ■ *Relieve* INVENTORY RECORDS
- *Prepare* BRANCH SHIPPERS
- 55 ■ *Investigate* CUSTOMER CREDIT STATUS
- 56 ■ *Prepare* CUSTOMER LISTING

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

equipment, is evaluated by a member of the technical staff who is expert in the operation of that particular machine. In this way, we come close to the ideal situation where we maintain the objectivity very necessary in equipment evaluation, and at the same time supply specialized talents ordinarily impossible to obtain in an internally organized equipment evaluation.

The first step in the equipment evaluation is to prepare the consolidated machine runs for each computer. This is done by optimally combining the unit runs in the most efficient manner for each set of equipment. Compatible unit runs are combined until one of the limiting characteristics of the particular equipment is exceeded, such as the number of magnetic tape units or the internal capacity.

CHART EIGHT

This chart is an example of just such an evaluation for the 650 RAMAC.

CHART NINE

This chart illustrates the consolidated runs on the IBM 705. You can understand now, that having laid out the unit runs, the process of completing the consolidated machine runs for any equipment is a relatively simple matter of combining or arranging. Once the consolidated machine runs have been drawn up, it is possible to specify the specific complement of equipment required to operate the system.

We can now proceed to the next step in the equipment evaluation which is the determination of running time. It will be typical of each set of computer hardware, that running times for average and peak loads will be significantly different. Perhaps so different that some will be eliminated, exclusively because they are incapable of accommodating the peak data processing load.

CHART TEN

Here is just such a chart evaluating the consolidated machine runs on the IBM 650 RAMAC. But in addition to obtaining the total running time--daily, weekly, or by whatever period processing may be required--it is important to show how this running time will be accommodated on an actual daily basis. The technique for this is to utilize the 24 hour Gantt chart, laying out the computer operations just as if they were factory operations. In this way we will see that there is sometimes enforced idle periods on the machine, because off-line processing is holding up the next computer run. Thus the total elapsed time can easily exceed the total running time. Only in this way can the equipment evaluation team see the total time effect of all the data processing the system requires.

How UNIT RUNS *are* CONSOLIDATED into MACHINE RUNS

IBM 650 RAMAC

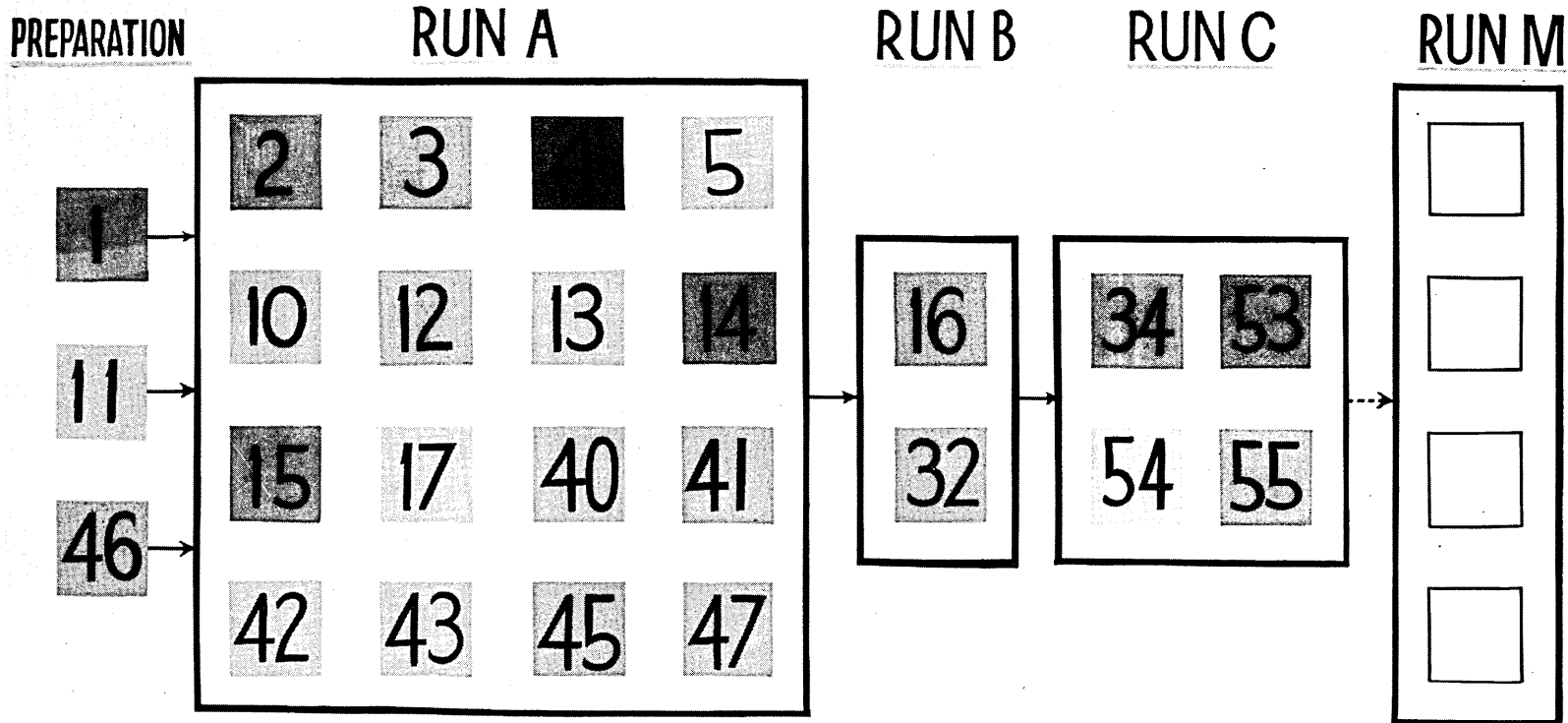


CHART VIII

How UNIT RUNS *are* CONSOLIDATED *into* MACHINE RUNS *for* IBM 705

PREPARATION

RUN A

RUN B

RUN C

RUN D

RUN E

RUN W

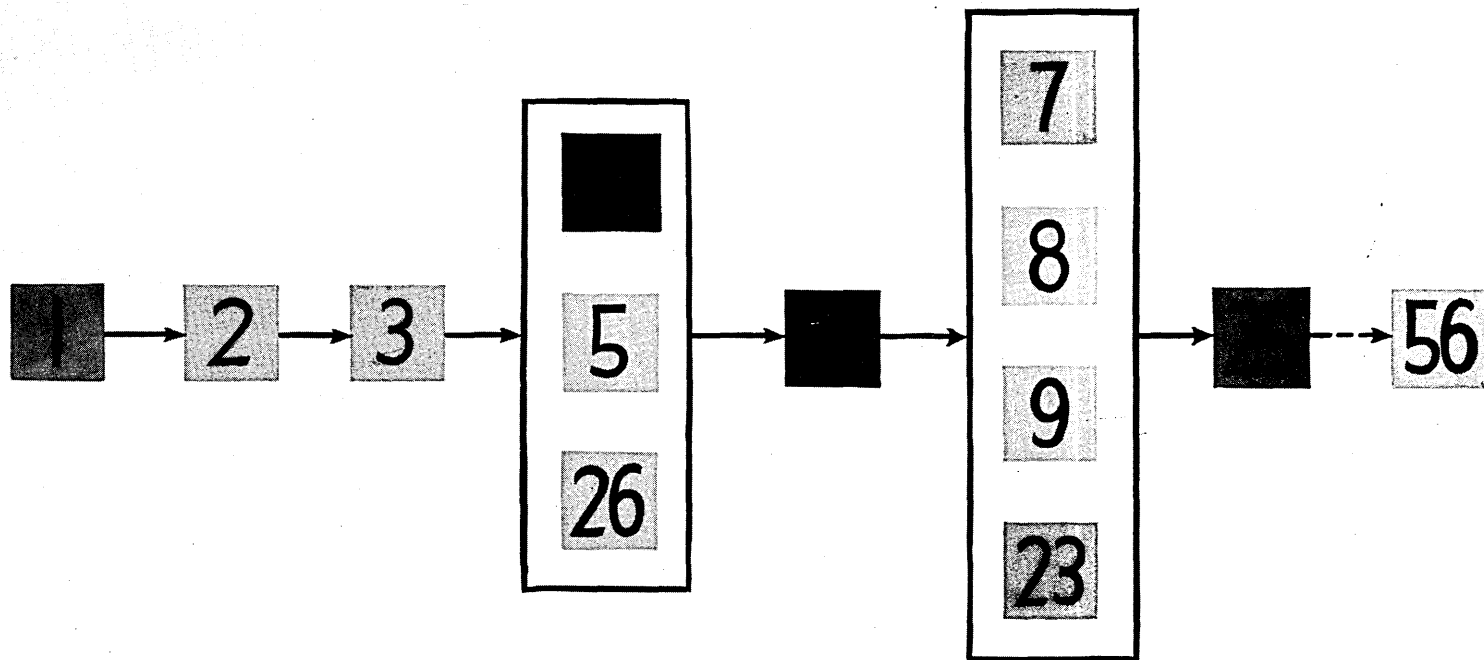
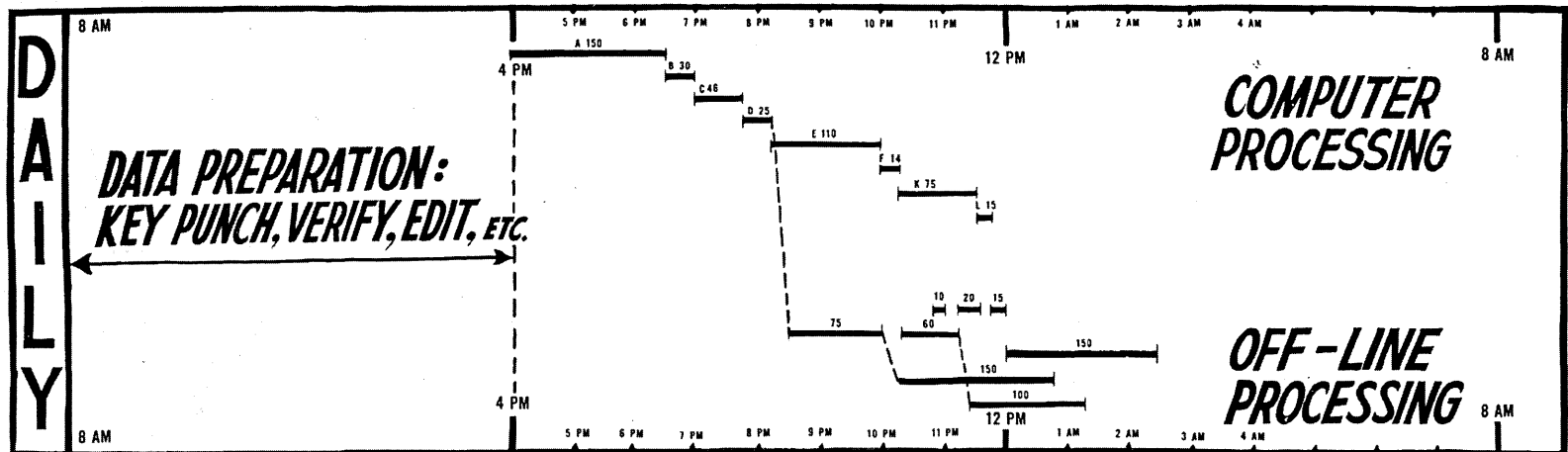


CHART IX

GANTT CHART PROCESSING TIMES

IBM 650 RAMAC



150 MINUTES of ADDITIONAL COMPUTER PROCESSING REQUIRED

400 MINUTES of ADDITIONAL OFF-LINE PROCESSING REQUIRED

38 MINUTES of ADDITIONAL COMPUTER PROCESSING REQUIRED

23 1/4 HOURS of ADDITIONAL OFF-LINE PROCESSING REQUIRED

This is an especially important consideration because it is possible that off-line processing can dominate the total data processing program.

Having obtained the consolidated machine runs, laid out the running times on Gantt charts, and having determined the specific complement of equipment, it is now possible to determine the cost of the proposed electronic data processing system, including both equipment and personnel.

You will have an option, depending upon the particular situation as to whether the cost should be charged off to a single application, or if it should be prorated for the actual time used. This will depend upon whether this application alone is to justify the electronic equipment, or whether it will be combined with other applications on a prorated basis. It is typical of a centralized data processing system, that all applications will be prorated. Each will then carry its respective load of cost and potential savings.

The specific operational advantages of any one set of equipment can now be clearly stated. The proposed system and its complement of equipment and personnel are subject to detailed scrutiny to evaluate their operational advantages.

RECOMMENDATIONS AND CONCLUSIONS

By examining the individual equipment evaluations based upon the common postulated system, it is possible 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 for this particular application. If it is, we must outline the recommended system, based upon the individual equipment evaluations. The recommendation must include an operational, as well as an economic comparison.

CHART ELEVEN

The economic evaluation is a comparison of the displaceable costs 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. In many cases, these will have a tangible benefit, to which a dollar value can be ascribed. Although it is difficult to make a valid analysis of such elusive cost factors, it could happen that the entire evaluation process would rest upon the proper completion of this task.

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 a wise decision to

OPERATIONAL FEATURES *EDP* SYSTEM

1. *Reduction of* DATA PROCESSING TIME
2. *Improved* ACCURACY
3. MORE *Flexible* SYSTEM
4. MORE *UP-TO-DATE* INFORMATION
5. *Automatic* BELOW MIN. SIGNAL
BULK and PACKAGED INVENTORY
6. *Automatic* SHIPMENT of BACK ORDERS
7. *Automatic* PRE-TIMING of SHIPPERS
- *8. **RANDOM ACCESS**
TO INVENTORY, Master PART, Master CUSTOMER & COST of SALES

* IBM 650 RAMAC FEATURE

install the electronic equipment, based upon better reporting and the other intangible benefits. In any case, the intangibles must be examined with considerable care to determine their reliability.

It is interesting to note that the present economic trend in the cost of manual or semi-automatic systems is constantly increasing per unit operation. With an electronic system, an increased volume resulting from expansion would mean simply more time on the equipment, or at worst, more equipment. In the case of an electronic system, the increase in costs would be substantially less than a corresponding increase in a manual or semi-automatic system.

RESULTS OF THE FEASIBILITY STUDY

CHART TWELVE

In this chart you see some of the representative large scale, medium scale, and small scale electronic data processing machines which might be evaluated for any particular application. Some of these might be eliminated at the outset, because of availability, or because of the overall size of the application. For example, if the displaceable costs would not justify a large scale machine and if it must be evaluated on the basis of a single application, the large scale devices might be ruled out immediately (unless, of course, the intangibles weigh sufficiently heavily.) Similarly, it might become apparent that the small scale devices which aren't complete electronic data processing systems, may not be nearly powerful enough.

CHART THIRTEEN

Three of the computer systems shown on this chart must be eliminated because they are almost fully utilized on a 24-hour basis to satisfy the present data processing requirements of the customer whose operations were analyzed. An equipment which is utilized over 90 per cent of the available time does not have an adequate allowance for preventive and unscheduled maintenance (breakdowns). Of course, once we consider any volume expansion at all, these machines would be ruled out anyway because of their inability to handle increased load. Another of these systems could also be eliminated on the basis of cost alone, since it is more expensive to install and operate than other available alternate systems.

System "F" you will note, has been prorated. If this system could not be prorated, then it also would have been eliminated on the basis of cost alone, despite the fact that its per cent utilization is the lowest of all equipment evaluated. Assuming then that proration is feasible for this system, we have narrowed the selection to "E" system, a medium scale computer, and "F" system, a large scale computer.

WHAT EQUIPMENT IS AVAILABLE?

LARGE SCALE

IBM 702, 705

UNIVAC I, II

BIZMAC I, II

DATAMATIC 1000

MEDIUM SCALE

IBM 650

**UNIVAC FILE
COMPUTER**

**BURROUGHS
DATATRON**

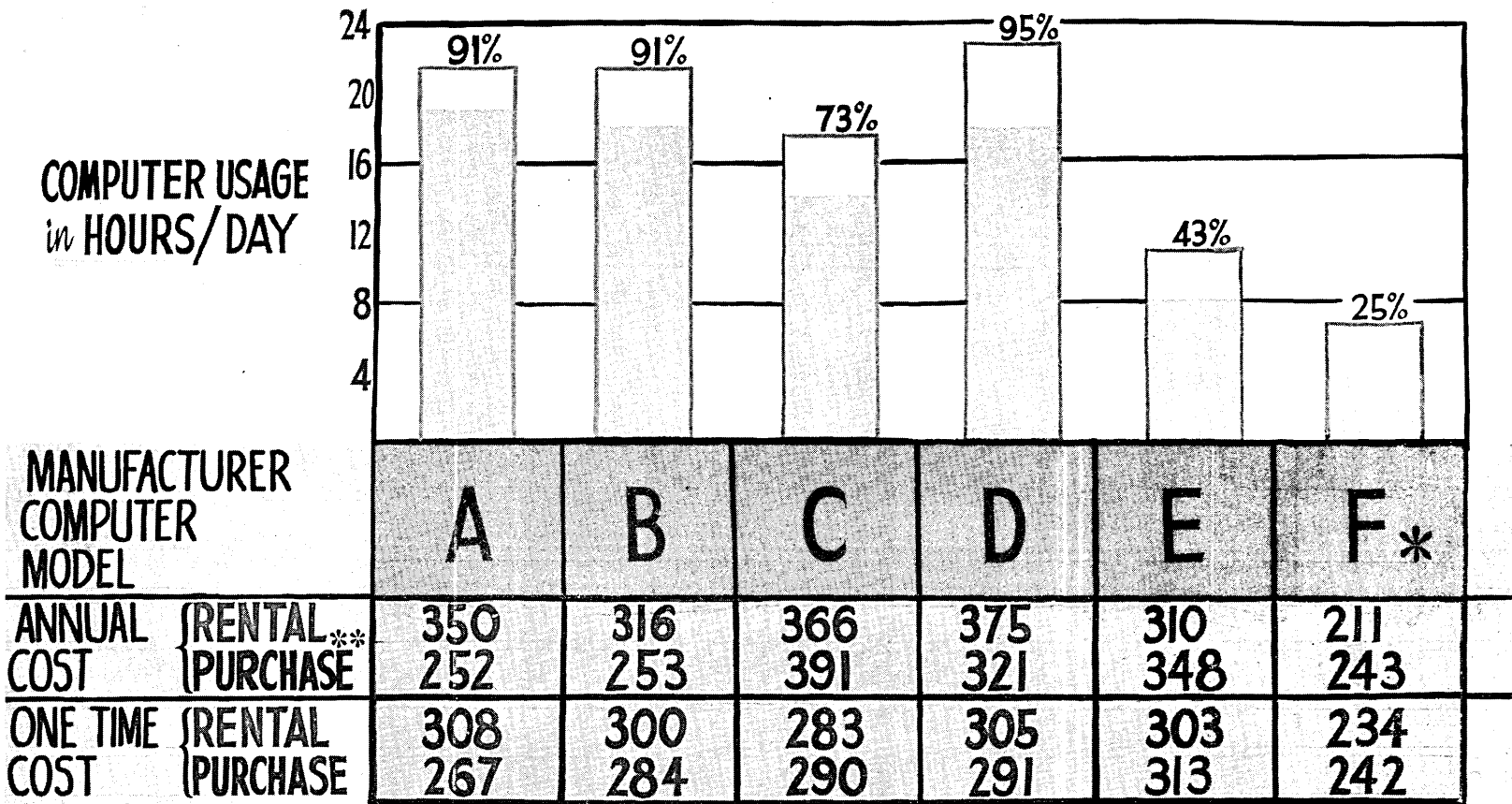
**UNDERWOOD
ELECOM-125**

SMALL SCALE

**BURROUGHS
E-101**

**UNDERWOOD
ELECOM-50**

EQUIPMENT *Time* UTILIZATION & COST SUMMARY



FIGURES SHOW IN THOUSANDS OF DOLLARS

*EQUIPMENT COST PRO-RATED FOR PART OF SINGLE SHIFT
 ** PURCHASE PRICE PRO-RATED OVER A 5 YEAR PERIOD

One of the difficulties with utilizing Computer F would be the requirement for a centralized facility in order to fully utilize the large scale equipment with applications from other divisions. The difficulties with the centralized facility, as with similar centralized services, are those of priority and liaison. These difficulties are particularly important in electronic data processing systems, as the first system and program designed is usually far short of the best one. The revision in the systems and programs, such as would be required for better reporting systems, which might evolve from utilization of EDP, can be much more directly and efficiently effected if the equipment is directly available to the operating division than if it is located in a remote centralized facility.

One of these two systems was to be chosen, and in the case of this client, Ramo-Wooldridge selected the "E" system. Since the additional benefits weighed heavily for System "E", and there was no problem in defining the client's desire for decentralization, the choice became relatively simple.

CHART FOURTEEN (Cost Breakdown)

In this chart we see the individual cost components which make up the summary costs presented in the last chart for Systems E and F. An intrinsic part of conclusions or recommendations for a Ramo-Wooldridge client, is the plan for implementation. Unlike most other consultants, the R-W electronic data processing consultant has not finished his job when he makes his conclusions and recommendations. Although the feasibility study itself is concluded at this point, there is a long road ahead.

CHART FIFTEEN

Now the detailed systems work must be done. The programs must be written, the conversion routines must be worked out and the programs and systems must be debugged. After debugging, the new electronic system must be run in parallel with the old manual or semi-manual system. The changeover must be done gradually, in phases, in order to minimize the problems of changing over to the new system.

SUMMARY

Today we have examined a technique of making a feasibility study. We reviewed first, the various approaches to the problem and then outlined the objectives of an integrated feasibility study and saw how important it was to adequately survey and describe the present system before embarking on the electronic data processing systems design.

You then heard one of the first descriptions of the unit run method of analysis and the resulting consolidations which take the form of machine

EDP SYSTEM COST ANALYSIS

General INFORMATION

MANUFACTURER MODEL	E		F *	
PURCHASE PRICE	\$1,279,000		\$1,613,000	
<i>Operating</i> PERSONNEL	6		6	
<i>Preparation</i> PERIOD	18 MONTHS		18 MONTHS	
<i>Preparation</i> PERSONNEL	8		8	
<i>Recurring</i> COSTS / YR.	RENTAL	PURCH.**	RENTAL	PURCH.**
EQUIPMENT				
ELEC. DATA PROC.	\$263,000	\$258,000	\$179,000	\$169,000
TABULATING (RENTAL)				
MAINTENANCE	INCL.	\$43,000	INCL.	\$42,000
PERSONNEL				
D.P. CENTER	\$30,000	\$30,000	\$15,000	\$15,000
SYSTEMS & PROGRAMMING	\$17,000	\$17,000	\$17,000	\$17,000
TOTAL	\$310,000	\$348,000	\$211,000	\$243,000
<i>Non-Recurring</i> COSTS				
FACILITIES INSTALLATION	\$40,000	\$40,000	\$35,000	\$35,000
PERSONNEL	\$96,000	\$96,000	\$96,000	\$96,000
CONVERSION	\$90,000	\$90,000	\$50,000	\$50,000
PARALLEL OPERATION	\$77,000	\$87,000	\$53,000	\$61,000
TOTAL	\$303,000	\$313,000	\$234,000	\$242,000
* Equipment cost pro-rated for part of single shift				
** Purchase price pro-rated over a 5-year period				

NEXT PHASE PROGRAM

1. EDUCATION & TRAINING

SYSTEMS ANALYSTS

PROGRAMMERS

OPERATING PERSONNEL

EXECUTIVE ORIENTATIONS

2. DETAILED SYSTEMS DESIGN

3. DETAILED PROGRAMMING

4. PROGRAM "DEBUGGING"

runs. These in turn can be individually evaluated for a wide range of computers. Such evaluations are both operational and economic.

All of the data submitted in this description of a feasibility study has been used in the successful culmination of client problems of Ramo-Wooldridge. Because it has worked effectively, we call it a proven client method. It is essentially a simple, straightforward approach to a complex problem which we recommend you weigh carefully when you undertake your own feasibility study.

102688969