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## Flow Charting - A Systems and Control Technique

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*Once a specialized industrial engineering technique, flow charting has become a common tool for systems designers, EDP analysts, and even auditors. This article reviews the basics of its use —*

## **FLOW CHARTING — A SYSTEMS AND CONTROL TECHNIQUE**

*by Harley H. Rudolph, Jr.  
Haskins & Sells*

**F**LOW CHARTING is a term we hear often these days. Formerly a specialized term used to describe process analysis in the field of industrial engineering, it has become part of the jargon of the electronic data processing field. The technique has widespread application in all types of systems work and is a useful tool for documenting the

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evaluation of internal control in the field of auditing.

In systems analysis and in specialized areas such as EDP the term *flow charting* is used to describe a variety of distinct charting methods. Within the EDP field there is considerable lack of uniformity in the use of terminology, and this is no exception. You may for example, hear the terms *block diagram* and *systems chart* used to denote to some groups the same concept that the term *flow chart* would denote to others. All would agree, however, that a flow chart

is a graphical representation of a procedure.

Some of the concepts covered by the generic term flow charting are examined in this article. Certain distinctions between two basic types of flow charts—technique flow charts and structural flow charts—are also drawn.

### ***Technique flow charts***

Technique flow charts illustrate the information requirements in a system and how they are to be met—that is, they show the method

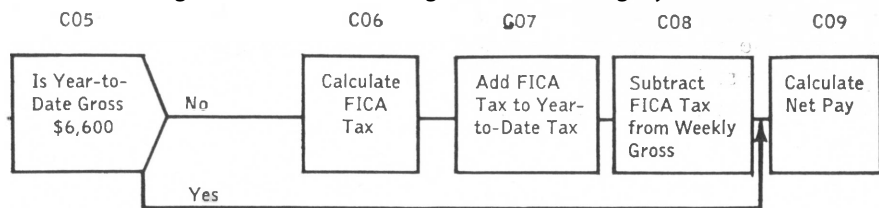


EXHIBIT I

that is to be used in manipulating the data.

A typical portion of such a flow chart for a computer payroll program may appear as shown in Exhibit I above. This portion of the system illustrates the method used to deduct Social Security (FICA) tax, if required, from individual earnings: First, compare year-to-date gross earnings to \$6,600; if greater than \$6,600, calculate net pay; if less than \$6,600, calculate the tax, add the amount to year-to-date Social Security tax withheld, subtract the amount from gross earnings, and calculate net pay.

Some in the EDP field will refer to this chart as a block diagram. The symbols used will vary. Some will indicate the direction of flow horizontally, as shown; others will indicate it vertically.

The technique flow chart is a prime tool of the computer programmer. It is of possible use to the auditor as evidence of documentation and evaluation of internal control in EDP systems. The structural flow chart, however, has wider application as a tool of audit and management advisory service personnel. Since this is so, we shall now examine the latter technique and some of its applications in greater detail.

### **Structural flow charts**

Structural flow charts (illustrated by Exhibit 4 on page 29) show kinds of input, origin, quantities, and so forth. They illustrate the flow through processing, the files maintained, and the output. In con-

trast to technique flow charts, they do not indicate how the processing is performed.

The structural flow chart is a useful tool in two functions: (1) as a method of reviewing the actual operation of the system of internal control by tracing the documentation, and (2) as a systematic approach to gathering the facts prerequisite to developing improvements in systems or procedures or both. The first function is of greater interest to the auditor; the second, to the management advisory services consultant.

### **Internal control documentation**

As a technique for reviewing the operation of the system of internal control, a flow chart of the documentation may supplement the conventional internal control questionnaire and may be regarded as an extension of it. Flow charting is a technique that can be used for organizing and analyzing factual evidence in depth.

To understand the usefulness of flow charting in the analysis of in-



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*The technique flow chart is a prime tool of the computer programmer. The structural flow chart has wider application as a tool of audit and management advisory service personnel.*

internal control, it is helpful to have in mind the meaning of internal control. The statements in the following paragraphs should serve the purpose.

internal control must be a useful tool to the auditor.

**Use of flow chart**

A properly constructed flow chart illustrates the organizational features separating the functions of operations, custody, and accounting. Such a chart indicates the personnel who discharge the responsibilities of each function. It reveals the documentation supporting the actions taken — the authorization, consummation, and accounting for transactions. The soundness of practices is revealed by the controls and methods in evidence to safeguard the accuracy and reliability of accounting data.

A review of internal control as a guide to determining auditing procedures is one of the first steps in an annual audit. For a new engagement, however, it is especially helpful to prepare flow charts illustrating the flow of accounting information through an entire system: the documentation, files, and records maintained. Such a detailed review greatly facilitates development of the initial audit program. It serves to familiarize audit personnel with the details of a client's system and procedures before they undertake the detailed audit program for the first time.

**A consultant's tool**

The management advisory services consultant finds flow charting an indispensable tool in several facets of his work. Although they are not always readily discernible, there are five basic steps in rendering most management advisory services:

- Gathering the facts
- Analyzing the facts
- Considering the alternatives
- Developing recommendations
- Implementing the changes

The flow chart is a most important tool for gathering the facts about a situation. Just as one picture is worth a thousand words, so

**Nature of internal control**

Internal control comprehends—  
 “. . . all of the coordinate methods and measures adopted within a business to safeguard its assets, check the accuracy and reliability of its accounting data, promote operational efficiency, and encourage adherence to prescribed managerial policies.”<sup>1</sup>

“Internal control is basically the control of actions in the planning, initiation, execution, and recording of transactions. Control is prescribed by the establishment of policies and methods to regulate the actions; it is evidenced principally in the documentation of actions taken.”<sup>2</sup>

An adequate system of internal accounting control furnishes—

“A plan of organization which provides appropriate segregation of functional responsibilities,

“Personnel of a quality commensurate with responsibilities,

“A system of authorization and record procedures adequate to provide accounting control over assets, liabilities, revenues, and expenses, and

“Sound practices to be followed in performance of duties and functions of each of the organizational departments.”<sup>3</sup>







Charles E. Wilson of General Motors fame said, “No physical activity goes on in our modern age without a piece of paper moving along to guide it.”

It must be apparent from these passages that a technique for representing the documentation that reflects the activity connected with

<sup>1</sup> Auditing Standards and Procedures—Statements on Auditing Procedure No. 33, issued by Committee on Auditing Procedure, American Institute of Certified Public Accountants, 1963, p. 27.

<sup>2</sup> Internal Control in Electronic Accounting Systems, Haskins & Sells, 1965, p. 9.

<sup>3</sup> *Ibid.*, 00.28-29.

-  Origin of a record
-  Handling operation
-  Adding to a record
-  Move
-  File or dispose
-  Inspect, review, verify, etc.

**FLOW CHART SYMBOLS**

**EXHIBIT 2**

**Conventions for Flow Charting**

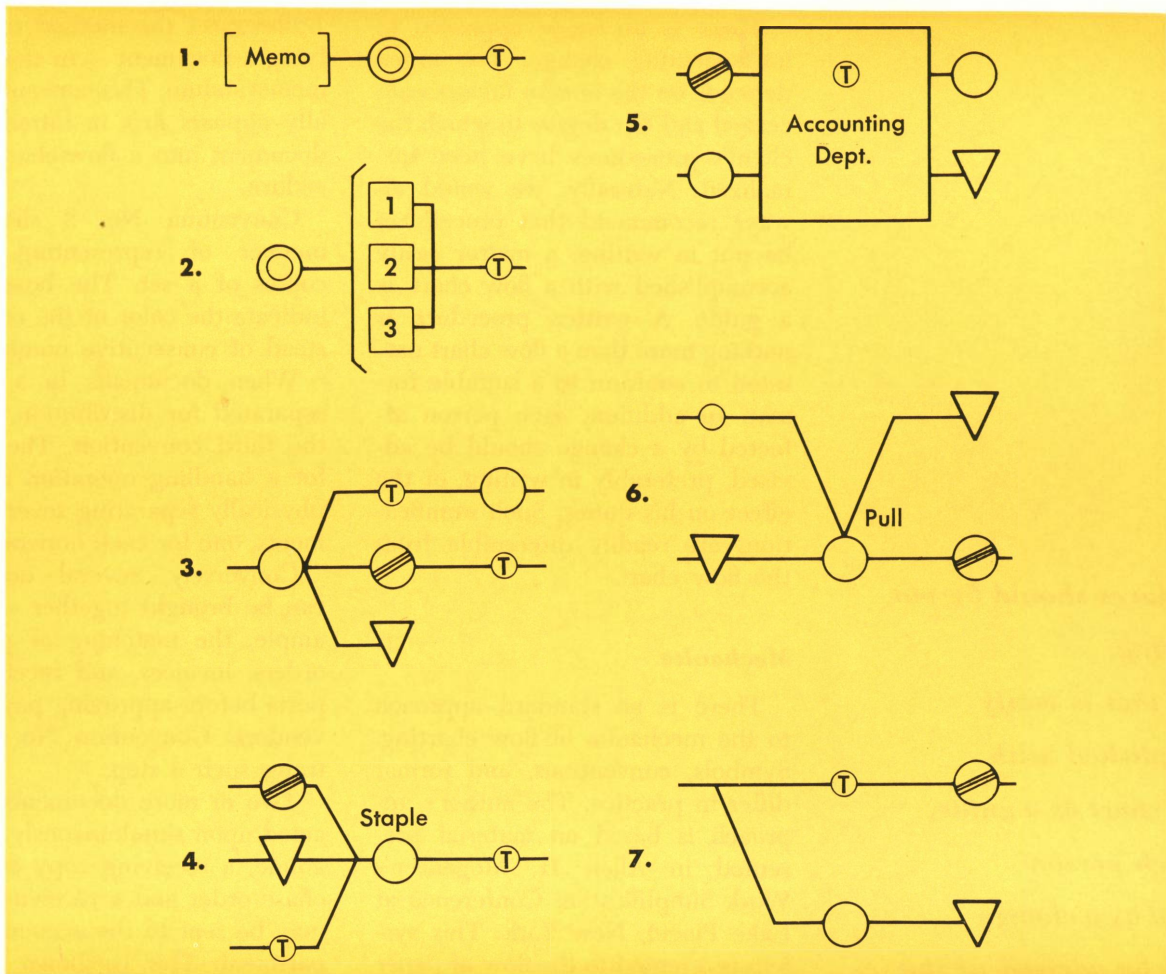


EXHIBIT 3

the flow chart will reveal opportunities for improvements that were never apparent from the written procedure. Most management advisory services engagements begin when symptoms of inefficiency or lack of control become apparent. Usually solutions are not readily perceived. The consultant's first task is to gather the pertinent facts. He can then bring his experience and judgment to bear in analyzing these facts and identifying possible improvements.

**Common error**

Unfortunately, many assignments begin with the last step. For ex-

ample, the request to "install a computer" sometimes comes before any evaluation of the client's needs or any consideration of the economies of possible alternatives. Assuming the client insists on so qualifying the assignment, we nevertheless find that we cannot move from point A to point B without first establishing the location of point A. In other words, we cannot plan to change from the present system to a computer system without first understanding the present system.

The value of the flow chart in the second step—analyzing the facts—is self-evident. In a graphic presentation the interrelations between

functions are much more readily discernible.

In the third step—considering alternatives—the graphic presentation again facilitates the process: What is the effect of each contemplated change in procedure? Where and how is the information used? Who should be consulted? What will be the effect on files and reports? And so forth.

Developing recommendations is usually a matter of defining existing problems, promoting understanding, and gaining concurrence in support of indicated changes. The tried and proven technique of showing *before* and *after* pictures is appropriate. Again the flow chart

### ***Value of written procedures***

There is no single approach to implementing change. Too much depends on the human factors concerned and the degree to which the client's procedures have been formalized. Naturally, we would always recommend that procedures be put in writing, a matter easily accomplished with a flow chart as a guide. A written procedure is nothing more than a flow chart narrated to conform to a suitable format. In addition, each person affected by a change should be advised, preferably in writing, of the effect on his duties. Such ramifications are readily discernible from the flow chart.

***Procedures should be put in writing, a task that is easily accomplished with a flow chart as a guide, and each person affected by a change should be advised of the effect on his duties.***

### ***Mechanics***

There is no standard approach to the mechanics of flow charting. Symbols, conventions, and format differ in practice. The author's approach is based on material presented in Allen H. Mogensen's Work Simplification Conference at Lake Placid, New York. This system is oriented to the flow of paper work, a distinction that must be borne in mind at all times. We are not charting the movement of people or equipment. We are tracing the flow of paperwork and, more specifically, the information that each document contains.

### ***Symbols and conventions***

The symbols used are largely a matter of individual preference. Some common ones are illustrated in Exhibit 2 on page 26. Attempts are being made to standardize. At this point, however, no single system has gained universal acceptance. Standard Register, IBM, and others have developed plastic templates with various symbols. The author has found the symbols shown in Exhibit 2 to be adequate for representing most paperwork processing.

In preparing the flow chart there are certain conventions that we observe for the sake of clarity. These conventions are illustrated in Exhibit 3 on page 27. Convention No. 1 illustrates the method of identifying a document — in this case, a memorandum. This convention usually appears first in introducing a document into a flow-charted procedure.

Convention No. 2 shows the manner of representing several copies of a set. The boxes could indicate the color of the copies instead of consecutive numbers.

When documents in a set are separated for distribution, we use the third convention. The symbol for a handling operation indicates physically separating several documents, one for each horizontal line.

Conversely, several documents can be brought together — for example, the matching of purchase orders, invoices, and receiving reports before approving payment to vendors. Convention No. 4 illustrates such a step.

Two or more documents can be acted upon simultaneously. For example, a receiving copy of a purchase order and a receiving report may be sent to the accounting department. This is shown in Convention No. 5.

Convention No. 6 illustrates the effect of one document on another. The receipt of an invoice, for example, may be the signal for a clerk to pull a file copy of a purchase order.

Documents may be processed according to two or more alternatives, depending on circumstances. Convention No. 7 illustrates the method of illustrating this possibility. Such a situation is usually encountered in processing the receiving copy of a purchase order, depending on whether or not a complete shipment has been received.

The system of flow charting presented in this article observes one cardinal rule — a most important one to keep in mind. Each document shown is to occupy a separate horizontal line indicating every action affecting that document from

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 the point where it is introduced into the system to the final disposition. No other document, record, or copy is to be represented on that line. Simple as this rule may sound, the novice frequently has difficulty adapting to it. To ignore it is to invite confusion and misunderstanding.

**Sample application**

To illustrate the technique for preparing a typical structural flow chart, we have selected a familiar system — an order-entry, billing system for a small supplier. The following situation is illustrated by the flow chart in Exhibit 4 shown below.

When a purchase order and acknowledgment copy are received in the plant, they are sent to the order analysis group. The promised shipping schedule date is entered on both the purchase order and the acknowledgment, and prices are entered on the purchase order. The acknowledgment is mailed back to the customer.

From the purchase order a seven-part invoice-shipping set is typed. This set is made of two sections: Parts 1 through 4 and Parts 5 through 7, each section being of snap-out construction. Parts are as shown in Exhibit 5 on page 30.

The purchase order is stapled behind the numerical file copy of the invoice set, and the set is sent

to the invoice department, where it is put in the hold file by purchase order number until the items are shipped.

The shipping set is sent to the shipping room for posting to inventory records. The order is filled from stock. Shipments are entered and the packing slip-label copy (Part 6) is detached and sent to the customer with the shipment. Plant shipping checks quantities shipped on all orders against inventory. The set is separated, with the stock record copy (Part 7) being filed in plant shipping and the shipping order (Part 5) being sent to the invoice department for billing.

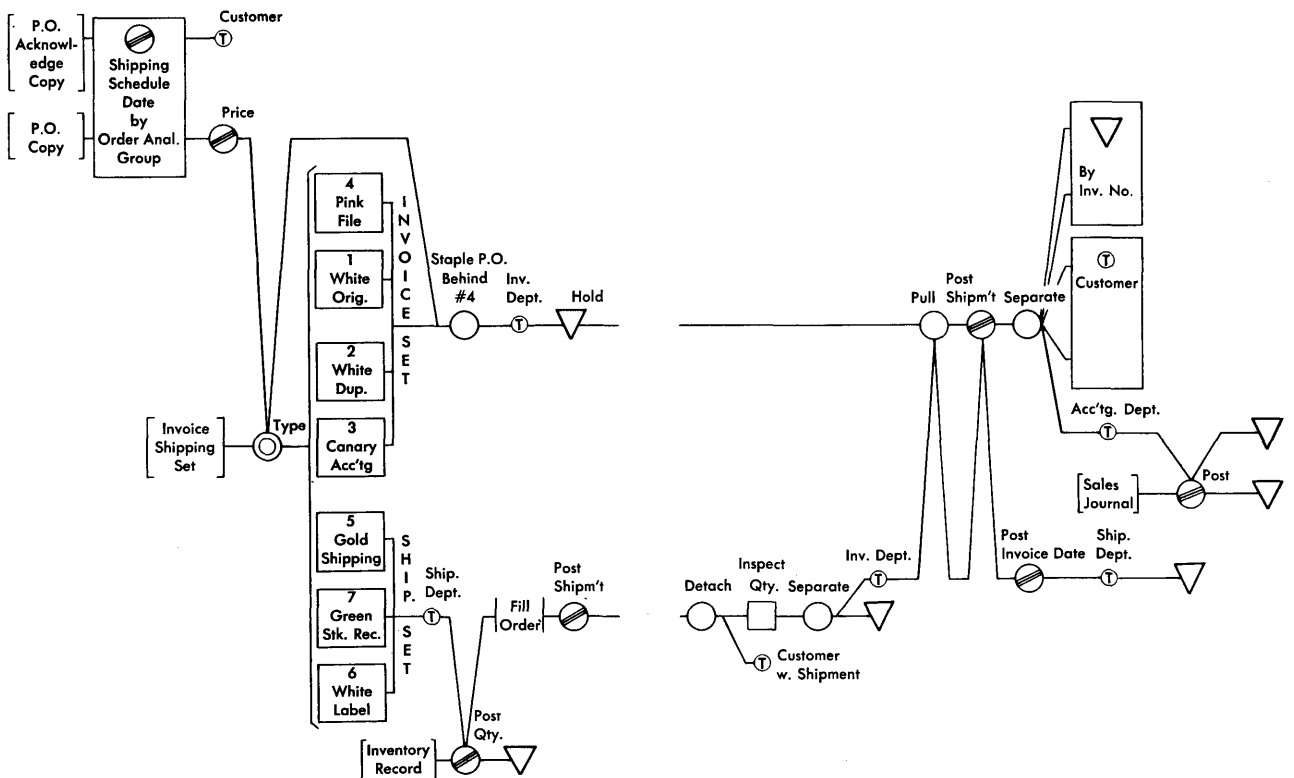
When the shipping order is re-

EXHIBIT 4

Summary	Pres.	Prop.	Diff.
⊙ Origin of Record			
○ Handling Operation			
◐ Adding to Record			
Ⓜ Move			
▽ File or Dispose			
□ Inspect			

**Paper Work Systems Analysis**

Sheet 1 of 1  
 Description: Order Entry—  
Billing Procedure  
 Present X Proposed \_\_\_\_\_  
 Charted by HR Date 2-7-66



INVOICE-SHIPPING SET		
Invoice Set	Part 1—Original Invoice	White
	Part 2—Duplicate Invoice	White
	Part 3—Accounting	Canary
	Part 4—Numerical File	Pink
Shipping Set	Part 5—Shipping Order	Goldenrod
	Part 6—Packing Slip-Label	White
	Part 7—Stock Record	Green

## EXHIBIT 5

*There are alternative ways of flow charting but only one criterion: The flow chart must illustrate the pertinent facts in a logical manner.*

ceived in the invoice department, the invoice set is pulled, the shipment posted, and the set separated. The invoicing (current) date is posted to the shipping order (Part 5), which then goes back to shipping for its control file.

The original and duplicate invoices (Parts 1 and 2) are mailed to the customer. The accounting copy (Part 3) goes to the accounting department for posting to the sales journal. This copy is filed in accounting by invoice number. The pink copy (with the customer's purchase order still attached) is filed by invoice number.

Anyone trying his hand at charting this system will recognize that there are alternatives to representing some of the steps. There is only one criterion, however: The flow chart must illustrate the pertinent facts in a logical manner.

### Conclusion

A structural flow chart is a useful tool for both the auditor and the management advisory services consultant. A flow chart portrays a process or procedure in a manner that facilitates comprehension of the several separate steps as one integrated picture. Consequently, a flow chart is excellent evidence of documentation in evaluating internal control; it is also a helpful tool in analyzing systems, developing improvements, and writing procedures.

As illustrated by the billing system flow chart, the technique forces

attention to details that might otherwise be overlooked. It brings into focus several factors vital to internal check, for example, distribution of duties and responsibilities within an organization; identity of offices that authorize, consummate, or account for transactions; measures in force to secure assets; and records maintained to ensure the accuracy and reliability of accounting data.

The management advisory services consultant also finds a ready use for the structural flow chart. Improvements in systems and procedures can only be developed after present methods have been thoroughly analyzed. The effect of changes must be thoroughly examined and understood by all parties before being executed. When in final form, the system should be documented in written procedures. Thus, throughout the entire rendering of management advisory services the flow chart will be found useful.

Often the auditor's and the management advisory services consultant's interests coincide, a circumstance especially true in new audit engagements. A thorough review of procedures to eliminate inefficiency and strengthen internal control facilitates a subsequent audit. The flow charts as developed by the consultant are useful to the auditor in gaining an understanding of the client's procedures and in forming a basis for evaluating internal control and designing the audit program.