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Integrated Data Processing in Business Accounting

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Mechanization of accounting functions permits use of a single item of data for a number of purposes. Here are some suggestions for the use of common data through a wide variety of uses in business—

INTEGRATED DATA PROCESSING IN BUSINESS ACCOUNTING

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THE AIM OF integrated data processing in business accounting is the optimum combination of individual functions, i.e., financial accounting, costing, payroll, stock control, investment accounts, statistics, planning, and management.

In a materials costing program, for example, integration of data processing demands not only that the costing should be carried out consistently and that summary stock and flow lists should be prepared but also that the same program should create output data that can automatically be used for

1. financial bookkeeping for entries in appropriate accounts
2. costing to establish the curve of operational costs
3. statistics for grouping materials used according to type, methods of production, or cost
4. planning for analysis of different types of material.

The output may also be in a form suitable for specifying or automatically printing orders. Integration may have the further meaning that these operations are carried out in the same program, depending on the requirements of the particular undertaking.

Types of integration

We must therefore endeavor in the statement of functions to set up the accounting headings so that there are minimum duplication and maximum use of all input data. As a matter of fact, the extent to which

this double integration is the measure of functional integration.

Mechanical integration, in contrast, aims to carry out simultaneously, so far as is possible, the separate stages of data processing, whether input, output, or internal computation. Success in mechanical integration depends on the type of configuration of the data processing system being used. For example, extensive sorting and collating operations are needed to extract data from conventional punched card machines, and separate processes are necessary for calculation, printing, and punching. With the introduction of punched card computers, on the other hand, these operations can to some degree be carried out simultaneously.

With automatic data processing installations using magnetic tape units and/or magnetic disk storage, mechanical integration reaches a still higher level, particularly through the economy in sorting and collating operations that results from the availability of larger memories and through the possibility, available in many modern systems, of running several programs simultaneously but independently of each other with common data.

Computer essential

The problems of mechanical and functional integration are, of course, intimately connected. It is seldom possible to handle the costing of materials and their specification on a properly integrated basis with a conventional punched card installation. The two can be functionally integrated only with the help of mechanical integration through a computer system.

No integrated system is eternal. It must be modified whenever the pattern of requirements or the available data processing systems or both are substantially modified. There is no such thing as optimal functional or mechanical integration once and for all.

counting system calls for analysis of the relationships among individual programs and their organization in such a way that the information needed for a particular program—and the results yielded by it—may be used for as many other programs as possible. Substantially increased efficiency can be obtained by using a single input of data in different ways in different programs. The relatively high cost per individual program of preparing data, in punching cards, for example, can be reduced if more programs can be constructed to use the same cards.

Costs

Unfortunately, the cost savings that can be achieved through the integration of data processing are difficult to quantify. It can be said, however, that the accounting system will operate more economically

- with a higher value of information output for a given expenditure on data preparation, transport, and processing and
- with a lower expenditure on these data operations for a given value of information in a desired limited form.

This proposition often facilitates decisions in practice. Suppose that, in the example of the material program cited earlier, it is proposed to calculate and print out future orders. Against the costs of reprograming, a trivial increase in card punching, and some minimal increase of machine operating time can be set a reasonably concrete value of information: Orders will be geared to requirements, minimizing risk of interrupting production; the most favorable order quantities can be calculated in each case; the possibility of exploiting rebates on substantial orders is enhanced; the workload of the purchasing staff will be reduced; etc.

The first requirement, therefore, is understanding and utilization of the functional interdependencies among the individual parts of the accounting system.

Interdependencies

To make use of interdependencies in the context of functional integration it is first necessary to recognize them clearly. To take an extreme example, it would be disastrous if the identities of sales representatives were omitted in invoicing details when there might be need, either now or later, to develop statistics on sales of products by sales representatives.

It is unwise to look too far ahead in introducing data processing systems in management accounting. In practice, however, all too often, because of ignorance of functional relationships and mechanical possibilities, attention is devoted only to the kinds of exploitation of information that are already in use —sometimes not even to all of these.

An important principle to be observed in the introduction of data processing systems is that the specification and construction of input should be planned in such a way that advantage can be taken of the maximum number of possibilities for exploiting individual data. Existing uses of information should be examined in terms of their necessity and their appropriateness to the purpose, and possible future requirements for information should be allowed for to the extent that is possible and economically acceptable.

The ancient principle, moderation in all things, applies to functional integration of data process-

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Table of Functional Interdepende

	Routine Programmes									
	Book-keeping 1				Statistics 2					
Sales(S)	In	m(F11) S51			In	m(items)	(items) Card index of items	S51	In	
	S 1	Accounts Receivable			S 2	S 21 Orders entered Orderbook position		S 22 Turnover	S 3	
	Out	Register of Accounts Receivable Statements of Account Sales Tax Records Bonus Records Commission Lists (Commission allowance on payments received)			Out	Statistics under:- Types of Customer Market Areas Types of Products Costings		As on left	Out	
Labour(L)	In	π aR	Card-index of Staff		In	m(order) L1 aR		Order Index(Order)	In	
	L 1	Wages and Salaries			L 2	L21 (Est.) Wages and Salaries	L 22 Work Performance		L 3	
	Out	Payslips (Gross,Net,Deductions) Payroll Records Coin Tallies Deduction Lists Pay Accounts			Out	Statistics under:- Methods of Payment Working Groups (personal records) Costings	Statistics of:- Types of Work Types of product Costings		Out	
Plant(P)	In	L2 P2 M1 F12	Past records of plant		In	m(order) P1 aR		Order Index (Order)	In	
	P 1	Assets (Book values)			P 2	P 21 Assets (Est.)	P 22 Use of Plant		P 3	
		Stock in hand Stock movements(incl. internal production) Land and Capital Tax Records			Out	Statistics of:- Est. Depreciation Est. Residual Value Est. Taxes by Cost attribution and types of plant	Statistics of:- Types of Plant Types of Product Costings		Out	
Materials (M)	In	m(Materials) F12	Materials Index (Materials)	Index of old Materials	In	M1			In	
	M 1	Materials			M 2	Materials			M 3	
	Out	Materials on hand Movements of Materials Lists of Materials entering			Out	Statistics under:- Types of Materials Types of Products Costings			Out	
Finances (F)	In	m(S51) L 1 S51			In	F11			In	
	F 1	F 11 Day-Book	F 12 Creditors		F 2	Records of Payments in			F 3	
	Out	Day-Book Payments In Payments Out	Register of Creditors Statements of Account Lists of Balances		Out	Statistics under:- Payment Targets Discounts Bonuses			Out	
Summary (Sy)	In	m F1 S 1 L1 P1 M1			In	m P2 S22 M2 L2 Sy3	Costings Index Orders Index		In	
	Sy 1	Financial Book-keeping			Sy 2	Sy 21 Operational Costs	Sy 22 Audit		Sy 3	
	Out	Main Accounts Gross Balances Turnover/Assets Accounts			Out	Curve of Operational Costs Output records	Audit Stocks of finished, semi-finished goods		Out	

Notes In = Input of data units: S1, L 2, M 4, Sy 22, etc = Programme designation
Out = Output of printed lists and data units, which appear as inputs to other programmes (m) =Dat
m(...) = Part of the required data can be taken over automatically, either from bole indexes (e.g. Ite
S51 = Input data units, registered automatically from other programmes (e.g. S 51 in invoicing pro
aR = Input data units, registered automatically (e.g. time - clocks for attendance, vehicle load

he Accounting System				Other Related Programmes 5				
lanning 3		Disposition 4						
S2	In	S2/3 L2/3 P2/3 M2/3		In	m(Item)	Customer Index Item Index	S51 F11	Customer Index
nning	S 4	Deployment of Sales		S 5	S 51 Invoicing		S 52 Reminder	
Surveys by:- Customer reas roducts	Out	Confirmation of Orders (where relevant) Deployment of Travelers and Publicity Resources		Out	Preparation of Advice Delivery Preparation of Invoices Goods Dispatched		Preparation of Reminders	
L22 Staff Index	In	S2/3 L2/3 P2/3 M2/3		In	L1		Staff Index	
our irements L 32 Labour redundant	L 4	Deployment of Labour		L 5	Wage and Salary Accounts			
of types bers Surveys of types and sections	Out	Job - cards Job - lists		Out	Preparation of Pay cheques and Remittances			
P22 Plant Index	In	S2/3 L2/3 P2/3 M2/3		In	as required			
P 32 d Plant abandoned	P 4	Deployment of Plant		P 5	Investment Calculation		Preventive Maintenance	
e and eeds tion Survey by type of plant and sections	Out	Job - Cards and Lists of Personnel engaged		Out	Rates of Return Forecasts of effect of investment needs on liquidity (Financial Planning)		Inspection or Maintenance Plans Lubrication Schedules Replacement of Parts	
S3 M2	In	S2/3 L2/3 P2/3 M2/3		In	m	M4		
of requirements of materials	M 4	Distribution of materials		M 5	M 51 Ordering	Suppliers Index Materials Index	M 52 Reminder	Supplier Index
rveys by types and quan- terials and by sections	Out	Delivery cards or transport vouchers for movements within the organisation		Out	Preparation of Orders Statement of Orders			
L3 P3 M3	In	S2 F2 L2/3 P2/3 M2/3		In	F4			Suppliers Index
lanning	F 4	Payments Schedules		F 5	Payments			
veys by:- In ut	Out	Notifications of payments		Out	Preparation of means of payment			
L3 P3 M3	In	S4 L4 P4 M4		In	as required			
Plans	Sy 4	Progressing and Delivery Date Plans		Sy 5	Statistical Quality Control			
d Credits Forecast ng projects	Out	Survey of Delivery Dates (and progressing)		Out	Control Plans or Surveys Control Directions Records of Control Results			

ts prepared manually.

ndex) or from the other programmes (e.g. Day-Book provides some data for the Accounts Receivable). Programme origins or index origins shown in brackets.

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e details can be punch-carded directly).

ing. To attempt a move into a highly integrated system on the first introduction of ADP would be just as stupid as to overlook the possible advantages to be gained from using functional interdependencies.

The golden mean

In any case, prudence in approaching integration is advisable in view of the relatively severe demands it makes on the management and organizational ability and understanding of many employees. Highly integrated systems, for example, those in which a closed loop can be set up from the initial orders and their modifications through production to invoicing, costing, and bookkeeping, quite simply demand too much from employees for it to be possible to begin at that level. Few people can grasp the totality of relationships within a highly integrated system immediately. Thus, the usefulness of such systems would perforce be small at the outset. An additional problem is the continual emergence of need for modifications, for in large programs a "chain reaction" can be built up, and substantial expenditure of time is required.

Moreover, the greater the degree of integration the more serious are the consequences of a stoppage of the ADP system, whether because of a program error or because of late arrival of data at the computing center. The result of such a stoppage may be an appreciable interruption of processing, with an inevitable reduction in the profitability of the system.

For these reasons it is absolutely necessary in practice to make a modest beginning in integrating data processing to gather experience and then to raise the level of integration only gradually and with an eye to economy and to balancing the risks.

The golden mean is not easy to find. It is most important for all individuals in management concerned with ADP to have an adequate understanding of it because active cooperation and constructive proposals can be expected from those concerned only when they have an overall picture of the ramifications of different functions and the methods being adopted. So long as employees persist in their own personal interpretations of their jobs, taking no account of the changes introduced by the ADP system, such psychological obstacles as distrust and fear of job loss will inhibit cooperation.

Functional interdependencies

The table on pages 32 and 33 shows the programs for all functions of the accounting system and for a part of the areas related to it. Input and output information can be easily identified. The triangles indicate functional interdependencies where the input data units arise automatically from other programs. The figures in each triangle refer to the program of origin.

The layout of the table expresses the interdependencies among the programs in the accounting system in two different ways:

1. The division by program function shows which data units are required for a particular program and their origin.
2. The division by data unit function shows to which program in the whole system one particular data unit provides the input.

An important advantage of the layout is in its systematic divisions. The horizontal divisions by sectors of the accounting system (bookkeeping, statistics, planning, and distribution of resources) and the vertical divisions by sectors of production mean that related programs can be shown side by side. These relationships suggest that it can be useful to construct a multiple program out of several related programs. For example, the vertical grouping of programs for the planning of labor force, plants, and materials in one multiple program may provide all the basic details necessary for the management of the production process, provided that the operational requirements are simple enough to be accommodated in a single program.

Such a grouping of programs usually saves data processing time. However, the storage and computation capacity of the machine and the types of input and output equipment must be such as to permit such multiple programs.

The table also can be used to determine which data for nonroutine decisions may be obtained from individual routine programs in the accounting system. Thus, the reject figures registered in the output program may provide an essential basis for quality control; the past or foreseeable records of peak capacity may be used for calculations of investment; etc.

In principle, the table can be applied to operations of any size. Individual programs, however, differ in scope and weight, depending on the individual relationships within a given undertaking.

The table may also be helpful in cases in which a fundamental decision about the introduction of computer systems is being considered, for example:

- when a computer system is to be introduced into the company for the first time
- when an existing punched card system is to be converted to automatic data processing
- when an existing computer system is to be extended to cover new functions.

Integration and organization

The present-day aim of integration is to achieve the greatest possible mutual matching and definition of present and prospective areas in which information has to be handled, using appropriate and economic data processing systems, whether already installed or available on the market.

The integration of data processing will yield valuable returns only, of course, where its use can be extended throughout the whole organization.