

Ir. H. H. Werthauer - R.V.B. Delft

Operational Performance Audit (OPA)

Introduction

Much has been published about methods to assess the soundness of working capital handling. Performing such an appraisal is part of the standard routine in investigations concerned with the functioning of organizations.

In the first stage of his survey, a consultant will ask his client-firm for such documents as

- the balance sheet
- the profit and loss account.

An analysis of these two statements, in the context of the annual report's narrative, is expected to indicate how financial resources have been handled. If the investigator has an extensive experience in a particular branch of business, he will be able to compare the financial performance of this firm with the results obtained by its competitors. If branch information is lacking, however, other non comparative analytic tools are applied, such as

- cash flow development
- financial ratio analysis.

Without intending to question the justification for such an approach, its outcome may be held in doubt, since no impartial criterion is available on which the figures of this particular firm can be checked.

Too many individual accounting practices may influence the results presented and too many factors of appraisal tend to render evaluation obscure. Some examples of these obscuring factors are:

- the consistent or inconsistent way of including depreciation of fixed assets into the cost
- the calculation of the standard plant capacity and the inclusion of under-occupation into either the product costs or the company results
- the evaluation for balance purposes, of the value of raw material stocks, work in progress and finished products
- the estimate of the value of such items as goodwill, research achievements or tools.

A balance sheet may look sound and the profit and loss statement may indicate a healthy operation, still doubts persist with a consultant who has to

perform a first investigation into a new field of activities. In order to reduce his doubts a consultant will conduct a number of interviews with the managers concerned, so as to obtain more insight into the routines. Still he will feel the lack of objective criteria on which to base his final judgement.

Some years ago this author was asked to prepare an integral interest calculation for the funds employed on one product in its productive process. The answer to this problem requires a combination of two elements:

- the funds spent on each stage of the productive cycle
- the length of time these funds are retained in each stage.

In order to visualize this problem, a diagram was drawn up, showing on the vertical axis the cumulative costs of the product and on the horizontal axis, the time span of its application until the moment of payment by the client.

Analyzing a number of those charts, the idea came up to extend its application to other fields. Since physically appreciable sacrifices account for most of the costing items, a similar computing routine could be devised to join costs and time into a system for visualization of such balance sheet headings as:

- the level of stocks
- the position of creditors
- the funds required for work in progress
- the value of outstanding debts.

A method was developed and tested for this purpose. This new tool immediately proved its usefulness making visible the consequences of operational procedures in terms of capital fund application; similarly changes in the operation could be expressed in terms of funding and thus be made comparable to the original situation.

The cost-time curve

Producing and marketing any product requires a sequence of operations, which, in turn can be expressed as a number of sacrifices required for the fulfilment of the process.

In a general way the cost build up in time sequence corresponds to the sacrifices for the materials and the productive stages of acquisition, preparation, transformation and disposal. The generic curve is shown in chart (0). The following stages can be distinguished in the specific case of a printing operation:

- order acquisition by the sales department (A)
- ordering material for production (B)
- tooling up for production (C)
- arrival of ordered material (D)
- receipt of the invoice for material (D)
- order preparation for production (E)
- waiting time (E/F)
- production and finishing (F/G)

- delivering and invoicing to the client (K)
- booking of payment for delivered goods (L).

Plotting the financial sacrifices of these stages (A/L) against the time scale, a curve will emerge that represents the development of the product cost in the course of the productive cycle. In this chart the amount of funds become visible that have been absorbed by such items as:

- stocks of material
- added value
- creditors
- debtors.

In chart No 1 the cost-time curve has been drawn up, whereas in chart No 2 & 2a the funding consequences have been marked. The length of time each heading retains the funds, indicates its weight with respect to the requirements of one week's work in the production (printing) department. The total area covered represents the funds required for one weeks operation of the production facilities.

Cost consequences of efficiency improvements thus can be converted into capital savings and evaluated with respect to the final benefit. Similarly the tasksetting for the operative cycle can be expressed in terms of optimal costs, leading to indications on the most efficient utilization of working capital. On this bases a consultant generates norms for an optimal balance sheet, against which the actual one can be compared so as to study the divergencies.

Construction of the cost-time curve

Practical experience has shown that companies (specially small ones) are reluctant to hand over to a consultant their financial reports. No such objections are met when general information is requested, such as

- volume of purchases per month
- sales of ready product per month
- sales of scrap material per month
- consumption of energy per month.

Computing each of these items into a chart, a number of details of the cycle become apparent.

In chart No 3 the sales-performance is reflected in a Z-shaped curve, to show the monthly performance, the cumulative effect over the year as well as the moving annual total. This chart shows the trend of operations as well as the shape of the seasonal cycle; its purpose is to serve as a tool for future projections and tasksetting.

Chart No 4 represents the timelag between order acquisition, production and debtors payments. From this chart the components of the cycle-time become visible.

In a subsequent step the cost-build-up is established for the average product. Average material consumption was known from the purchasing

record; now manpower costs, depreciation and productivity have to be established.

- manpower costs result from a headcount in the different departments. Either from the payroll total, or from the collective bargaining agreement, an average cost per worker can be deduced, representing the sum of income and social charges
- overhead salaries are charged to the direct wages in accordance with the organization chart. If the average income was derived from the payroll total, the same amount of money is taken here
- indirect wages, such as maintenance, stores or cleaning, are charged to the direct costs
- sales, purchasing, design and preparation are considered 'direct departments' in terms of contribution to added value
- general costs and expenses are added as a fixed percentage of manpower costs (f.i. 15%)
- depreciation is based on an estimate of the replacement value of machinery and equipment; life-time is taken in accordance with the visible signs of life expectancy. Depreciation thus calculated is added to the direct labour cost of the respective departments
- optimal productivity is reached when the operation is fully loaded; either from records on past performance or through ratio-delay studies, the maximum admissible load can be established.

In chart No 5 a cost allocation sheet is given for a printing operation. With the data thus compiled, the cost-time curve can be completed.

Profit or loss

Practice has shown the viability of a number of assumptions with regard to the operational results.

- under normal operational conditions profit or loss is the result of variances in
 - the price margin
 - the productivity
 - the productive efficiency.
- profit taking tends to run parallel to productivity. When the workload reaches full occupation, the sales department tries to obtain optimal prices
- utilization of material and labour resources, called efficiency, also follows closely the productivity pattern. When workload declines the workers' attention relaxes, speed of work falls and material waste increases proportionally
- overtime work never recuperates prior loss of productivity. Operators who have completed a normal day's work will perform at less than half of their normal efficiency. Overtime pay usually exceeds normal wages to such an extent that extra overhead coverage is largely absorbed by higher unit costs.

In the present example profit is the sum of two variables:

- the difference between earnings and costs
- the *productivity* result (P_t) or, budget result related to absorption of fixed costs.

The financial position of the firm now is followed on a monthly basis by examining its productivity and its flow of cash (chart 6):

- a month by month sales and deliveries record was drawn up for the past year (1980) and the two preceeding years (col. S in chart 6)
- collection period is 3 months; sales of January generate income in April (etc.)
- materials consumption in this case is a fixed percentage of the value of deliveries ($M = k \cdot S$)
- production cost is the sum of fixed costs (labour + overheads) and materials consumption. Fixed costs are shown on annual basis in chart 5
- flow of cash (C) is the difference between this months' income and costs.

The productivity or budget result is the difference between the total fixed costs and the contribution from this months' sales

- total fixed cost allows roughly for a production corresponding to the sales' volume of March '80 (f 622.000,); this is called the optimal turnover (S_o)
- productivity can be calculated as the part of the labourcost that remains uncovered by the present workload.

$$O_t = A \frac{S_o - S_t}{S_o}; \text{ the symbols in this equation represent}$$

O_t = productivity in period t, A = added value, S = sales volume or work load, respectively, optimal attainable (o) and realized in the period under consideration (t).

In chart No 6 the cash flow and the budget result (productivity) have been calculated. In order to show the cyclic recurrence of profits, losses and liquidity problems, chart No 7 has been drawn up. From the figures of chart 6 to show the danger points of low liquidity at moments of increasing productivity.

Construction of the balance sheet

For any point of time an adapted cost-time curve reveals the values of material stocks, work in progress, creditors and debtors. Profit or loss can be readily calculated. The value of fixed assets have been estimated. The requirments for cash result from the need to pay regularly wages, salaries, purchases and general obligations. In the first year of the present case it is estimated that cash is available to cover one month's expenditures. Chart No 6 shows a flow of cash that does not require special provisions for periods of a negative cash balance. Moreover, the following years indicate the

accumulation of such a depreciation fund reserve, that excessive liquidity prevails as long as no major investments are made.

From the above mentioned data the sum of owners equity and other longterm liabilities can be calculated. What proportion longterm loans will be allowed to take, is a matter of appreciation under the current conditions of capital market and banking policies.

If longterms loans have been contracted, payment of interest will have to be introduced as a cost item in the profit and loss account. The ensuing reduction of profit (or increase of loss) will be reflected in the balance sheet and affect the need for liquid means correspondingly.

In chart No 8 estimates are shown of the profit and loss accounts for the years 1978, 1979, 1980 and 1981. Simultaneously the respective balances are depicted. For this purpose an estimate of the salesvolume for 1981 was made from the Z-chart (3) and financial indications from the period '78/'80 were extrapolated.

Summary

This paper intends to provide the consultant with a methodology to appraise objectively the performance of any firm. From quantitative data of daily operations an approximation is made of liquidity and productivity via the cost-time curve, leading up to the preparation of a financial forecast in the shape of

- a test balance sheet
- a profit and loss account.

The applicability of this method has few restrictions: it works in all manufacturing processes that produce one, or a variety of similar products in a sequence of operations.

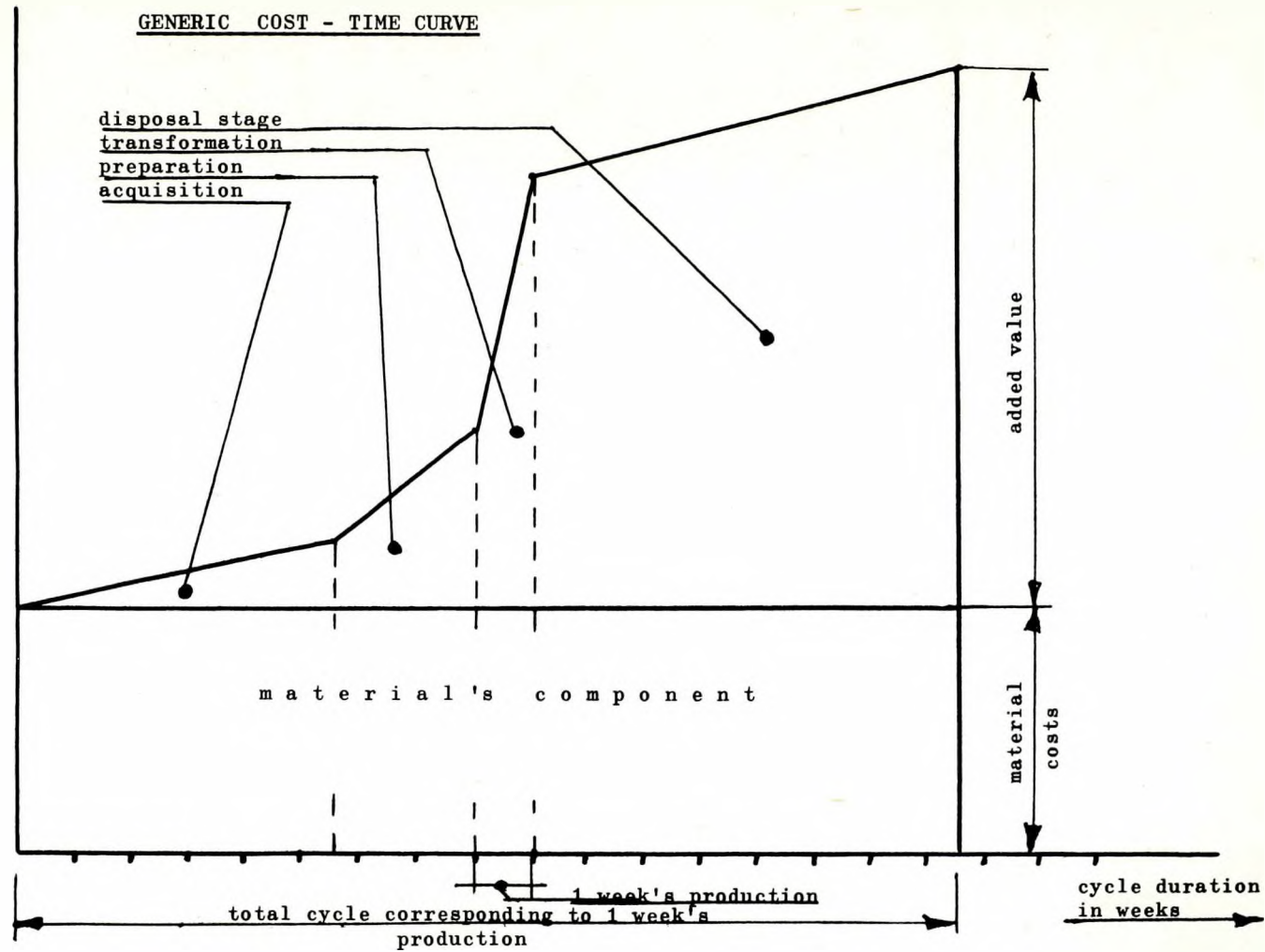
Variances of liquidity and productivity are shown as indicators of unstable operations that can endanger the financial continuity of the firm. In contrast to other methods of analysis the consequences of managerial decisions such as changes of production and sales procedures can be made readily visible.

The method allows for the introduction of situational changes, such as efficiency improvements, small investments and capital structure adaptations. Inflationary influences can be introduced at any stage, as well as attractions of payment and collection patterns.

The objective of handling this tool is to asses the effectiveness of working capital management. Due to the practical approach, this method allows for following through operational changes into their financial consequences. As such it is meant to be a tool for managerial decision making, as well as for counseling in consultancy processes.

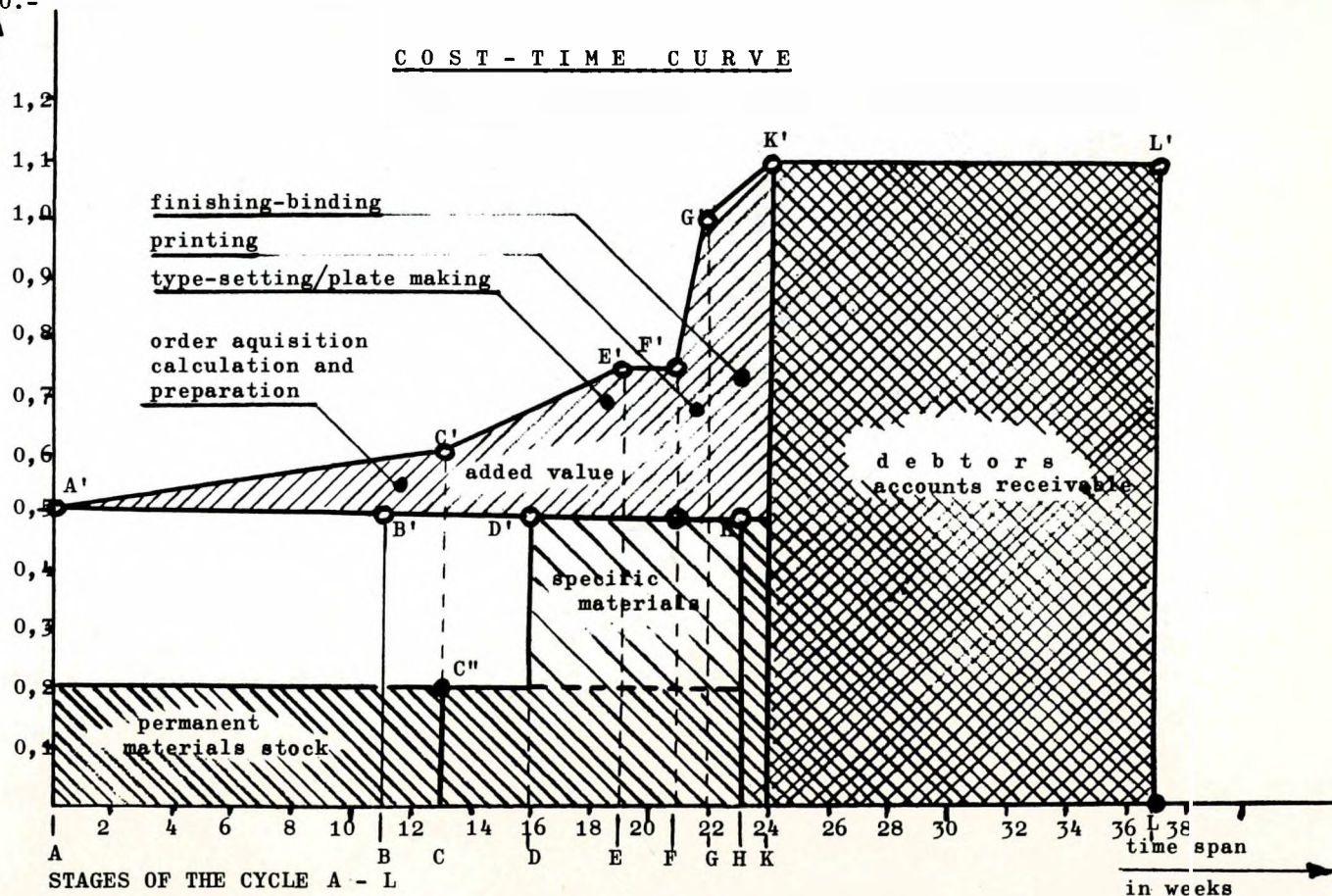
Product costs in f.-

GENERIC COST - TIME CURVE



Costs in
f 100.000.-

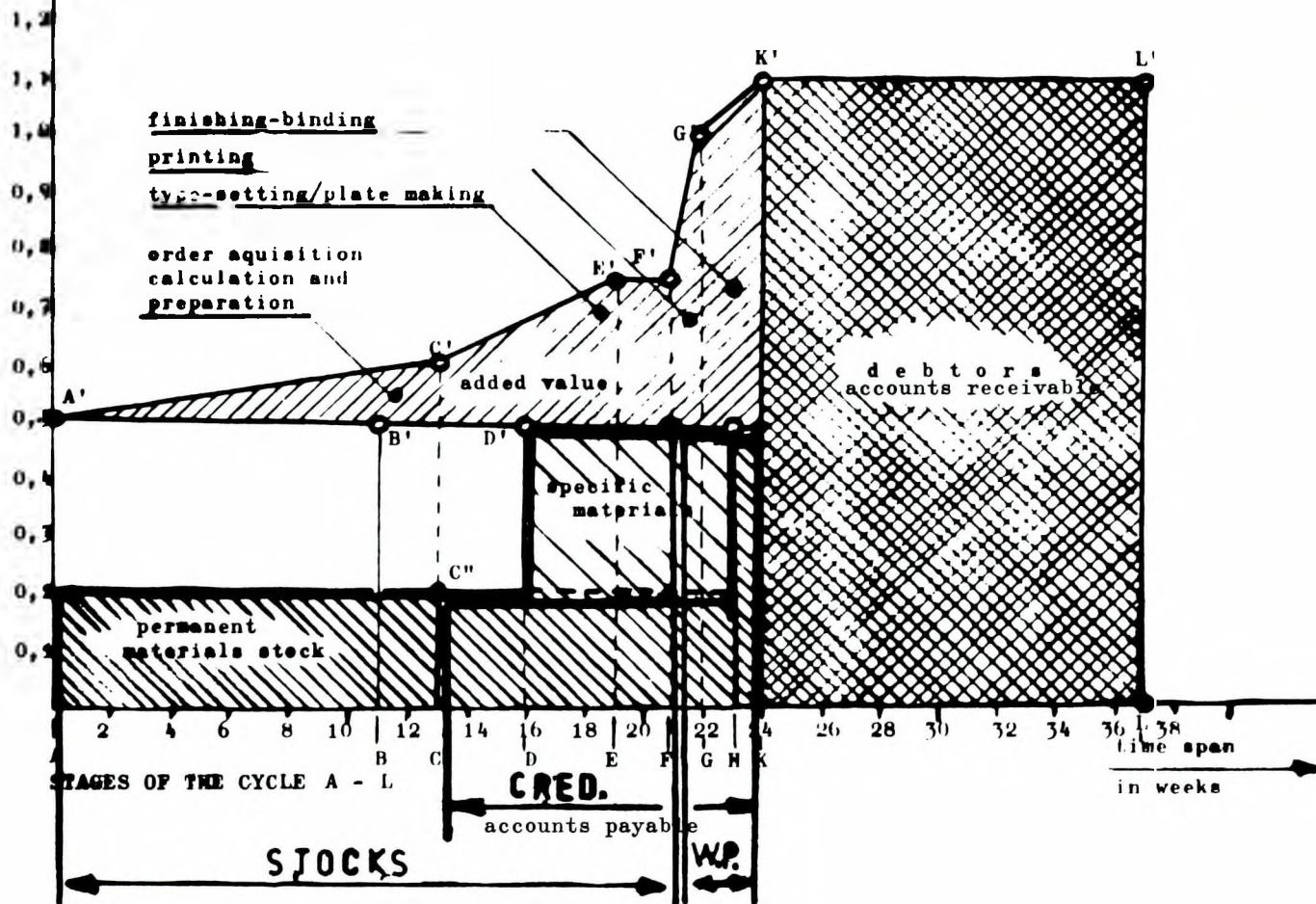
Chart N^o 1



Costs in
f 100.000.-

Chart N^o 2

C O S T - T I M E C U R V E

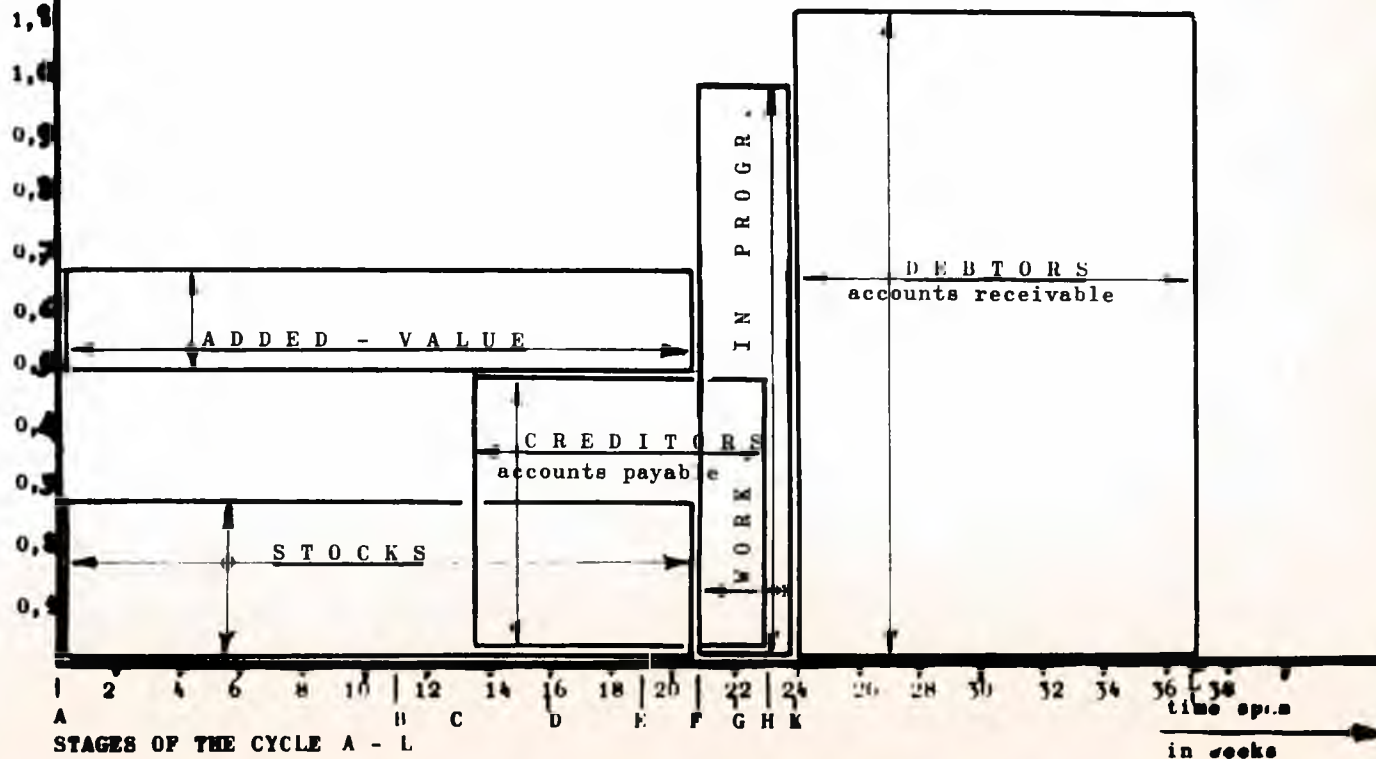


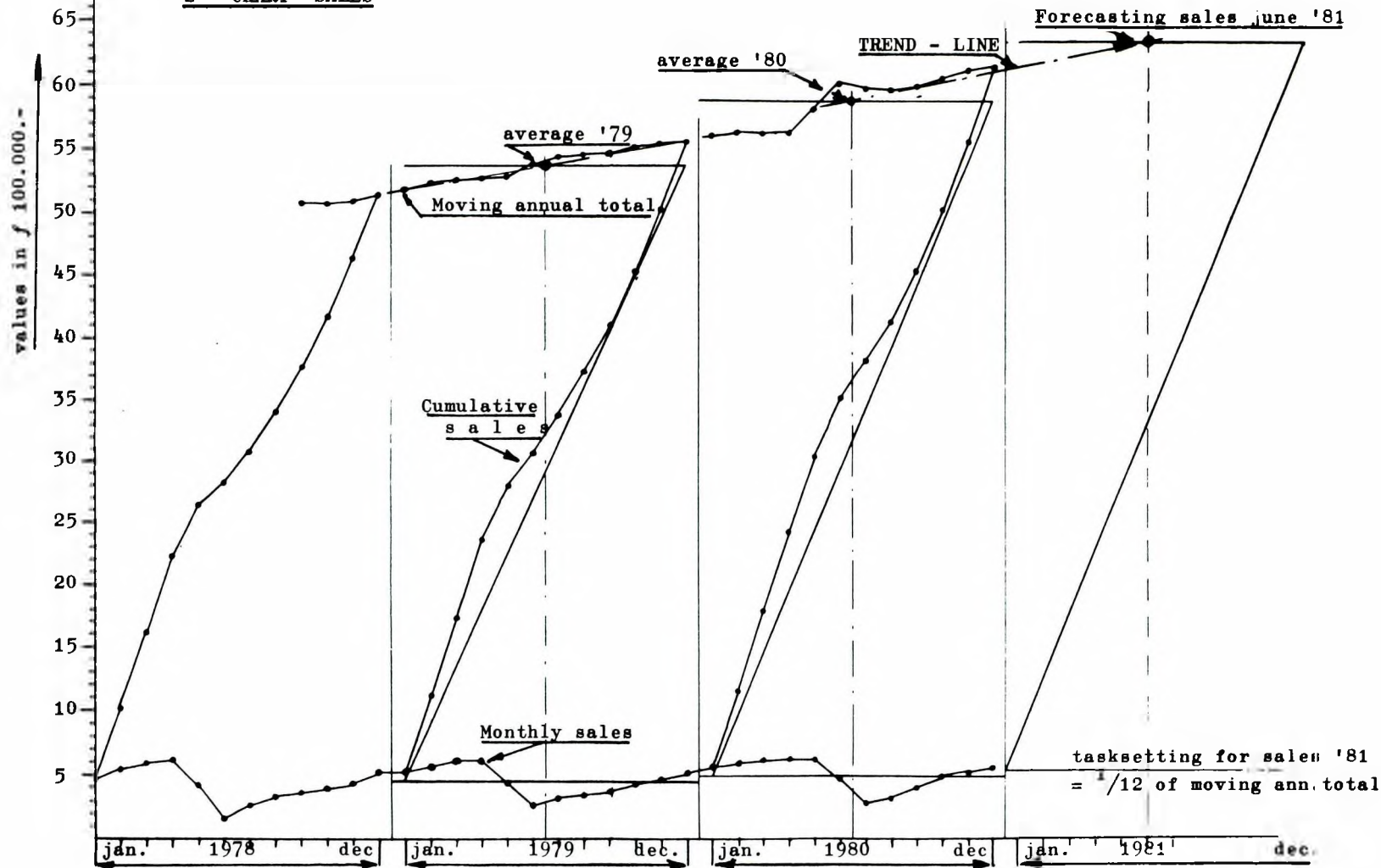
Costs in
£ 100,000.-

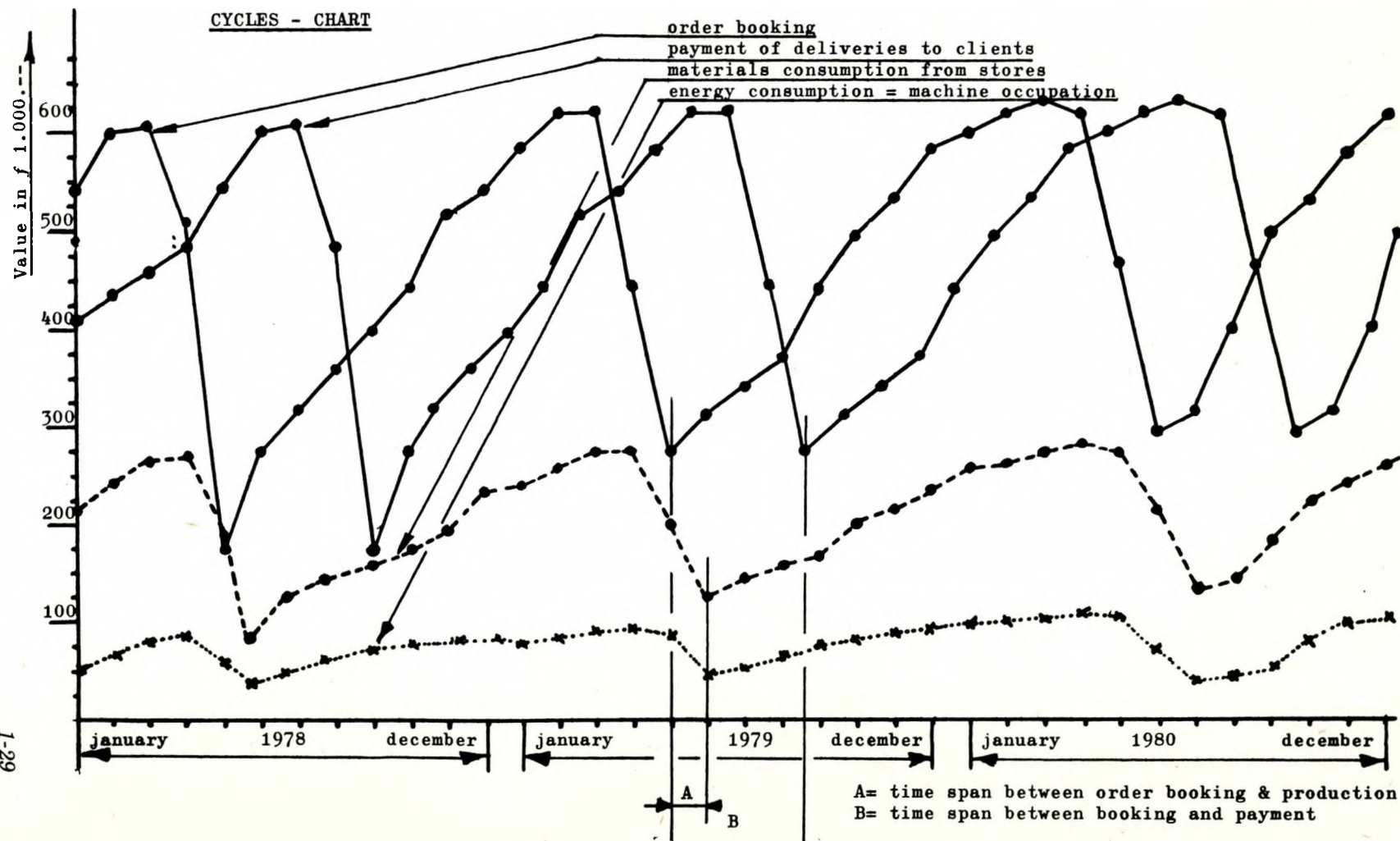
Chart N^o 2^a

COST - TIME CURVE

worked out for balance sheet construction



Z - CHART SALESChart N^o 3

CYCLES - CHART

C O S T A L L O C A T I O N

Chart N^o 5

departm.								
cost items	TOTALS	DIRECTOR	ADM.	SALES	PRODUCT. MANAGEM.	TYPE-SETTING ETC.	PRINTING	FINISHING
Personnel	54,5	1	6	8,5	4	12	15	8
Overhead distrib.			(7)	2,6	4,4			
Distribution					(8,4)	3	3,4	2
Direct pers.				11,1		15	18,4	10
Total payroll + soc. charg.	2,5 x 10 ⁶							
Cost P/worker	f40.000.-							
General cost	15%							
Total cost P/w.	f46.000.-			510.000		690.000	860.000	460.000
Depreciation	600.000.-			10.000		90.000	440.000	60.000
Dept. cost				520.000		780.000	1.300.000	520.000
Total sales	+ 6 x 10 ⁶							
Sales charge				9,6%				
Productive operatives						10	12	8
Productive hours P/manyar						1600	1000	1700
Hourly rate						f48,75	f108,35	f38,25

Calculation Sheet

all amounts in f 1.000.--

Chart N^o 6

1978					1979				1980			
1977 Oct. Nov. Dec.	Sales 410 430 460	Mat. cons. (M)	Budget result (0)	Flow of cash (C)	Sales (S)	Mats. consum (M)	Budget result (0)	Flow of cash (C)	Sales (S)	Mats. consum (M)	Budget result (0)	Flow of cash (C)
Jan.	480	215	- 32	+ 13	535	235	- 26	- 35	580	260	- 16	- 24
Febr.	545	240	- 8	+ 8	580	260	- 3	- 15	600	265	- 11	+ 16
March	600	265	+ 15	+ 13	620	275	+ 11	+ 45	620	275	- 2	+ 51
April	610	270	+ 20	+ 28	620	275	+ 11	+ 60	630	280	+ 3	+ 91
May	410	185	- 61	+ 93	445	200	- 66	+180	620	275	- 2	+116
June	175	80	-157	+338	275	125	-132	+295	470	215	- 60	+156
July	275	125	-116	+303	315	145	-112	+275	295	135	-133	+286
Aug.	320	145	- 97	+ 83	340	155	-103	+ 90	320	145	-123	+266
Sept.	360	160	- 83	-197	370	165	- 93	- 90	405	185	- 86	+ 76
Oct.	400	175	- 69	- 82	445	200	- 60	- 85	500	225	- 49	-139
Nov.	445	195	- 50	- 57	490	215	- 46	- 75	535	240	- 35	-129
Dec.	520	230	- 18	- 52	535	235	- 25	- 65	580	255	- 21	- 59
Total	5140	2285	-656	+491	5560	2485	-644	+580	6145	2755	-535	+746
Add.Val.	2925				3066				3110			
Deprec.	741				666				600			
Cash balance	-250				- 86				+146			
S ^o	536				590				624			
M ^o	249				263				277			
Lab.+Overh.	182				200				209			

Chart N^o 7

BUDGET RESULT AND FLOW OF CASH

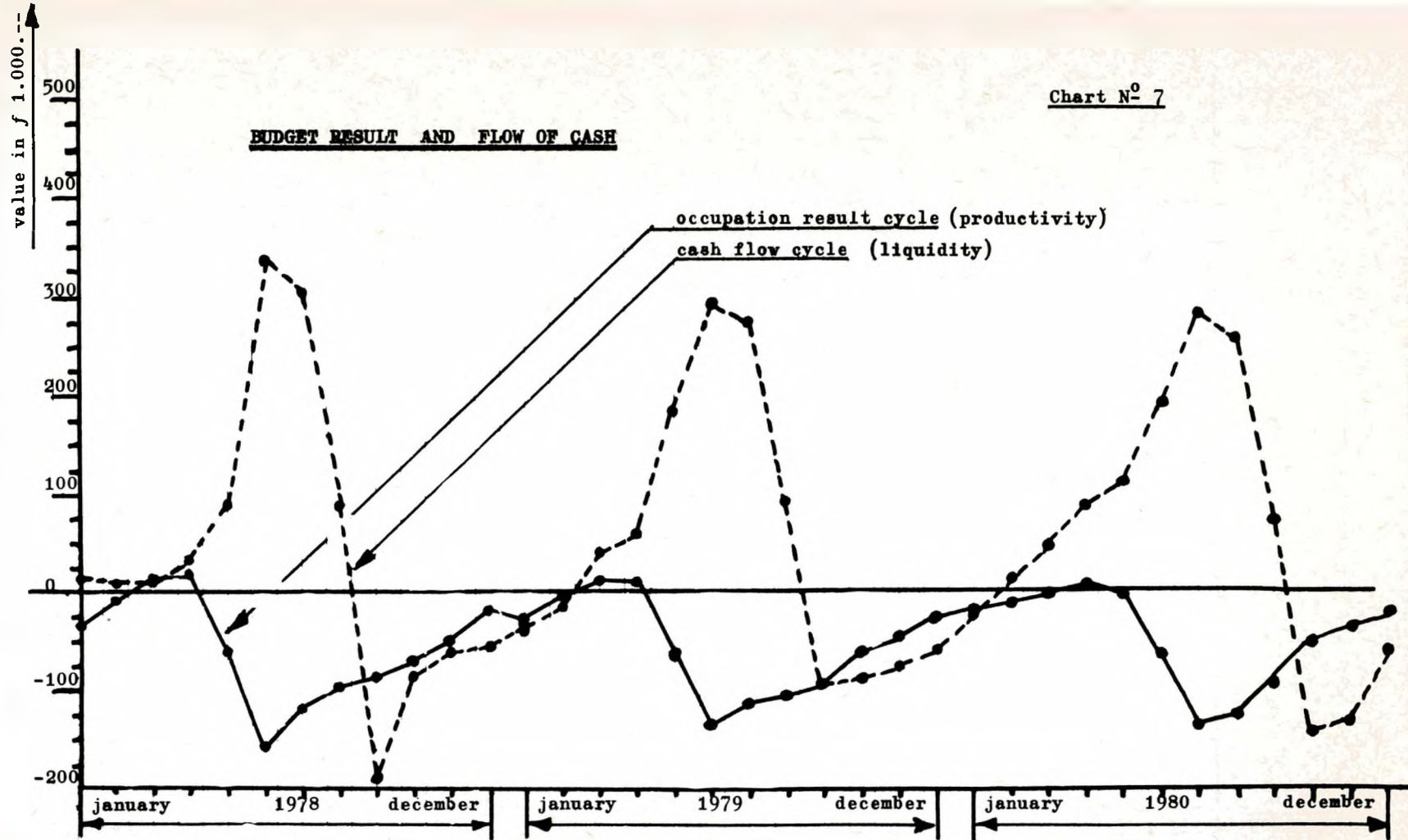


Chart N^o 8

	1978		1979		1980		1981	
<u>Profit & loss account</u>								
S a l e s	5160		5560		6145		6380	
Material consumption		2285		2485		2755		2850
Operational costs		2184		2400		2510		2700
Depreciation		741		666		600		540
Result	- 60		+ 9		+280		+290	
<u>Test Balance sheet</u>								
Fixed assets	7410		6660		6000		5400	
Material stocks	610		659		714		749	
Work in progress	236		266		279		294	
D e b t o r s (receiv.)	1365		1470		1615		1898	
C a s h	491		1071		1818		2385	
L o' s s	60		--		--		--	
Owners equity		9942		9882		9891		10171
Creditors (payables)		230		235		255		265
P r o f i t		--		9		280		290
T O T A L	<u>10172</u>	10172	<u>10026</u>	<u>10026</u>	<u>10426</u>	<u>10426</u>	<u>10726</u>	<u>10726</u>
all amounts x f 1000.--								