MANAGEMENT PLANNING WITH LABOR AS A FIXED COST:

The Mondragon Annual Business Plan Manual*

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July 1984

* The research and translation work for this monograph were funded by the German Marshal Fund of the United States. The translation of the Mondragon annual business plan manual, Plan de Gestion Anual de la Empresa, was performed by Christopher Logan and Francisco Diaz.

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PART I: MANAGEMENT PLANNING IN A WORKER COOPERATIVE

The Mondragon Cooperatives

This monograph on annual management plans in a worker cooperative is based, in part, on a planning manual used in the Mondragon worker cooperatives. Thus we begin with a brief description of the Mondragon cooperative movement.

Today there are over 85 industrial worker cooperatives with around 20,000 worker-members centered in the town of Mondragon in the Basque region of northern Spain. The industrial cooperatives form the core of the Mondragon group but there are also

* 5 agricultural cooperatives,
* 2 service cooperatives,
* 43 cooperatives schools using the Basque language,
* 14 housing cooperatives, and
* 1 large consumer/worker cooperative with over forty stores.

There are also the second tier or super-structural cooperatives with both cooperative and individual worker-members such as the

* Caja Laboral Popular (CLP) with the Banking Division of 141 branch offices and the Empresarial Division,
* Ikerlan, a technological research institute,
* League of Education and Culture, which includes a Polytechnical College offering engineering degrees, and
* Lagun-Aro, a social security and medical cooperative.

All these cooperatives of the Mondragon group are associated together by a contract of association with the Caja Laboral Popular (CLP) as the center or hub of the group [see Thomas and Logan 1982; or Ellerman 1982 for more general description of the Mondragon cooperatives].

The Caja Laboral Popular

From the initial office in 1959, the Caja Laboral Popular has grown in the 25 intervening years to be the 25th largest bank in Spain with 141 offices throughout the Basque region (with new offices in Barcelona and Madrid), with over 1,000 workers in the bank, and with around one-half million depositors.

The CLP is the group headquarters of the Mondragon cooperative group. The group is defined by the contract of association with the CLP which in turn is a credit cooperative for the associated cooperatives. The contract of association [see Appendix B in Campbell, et. al. 1977] specifies the relationship between the CLP and the cooperative such as the cooperative's capital contribution to the CLP, the deposit of surpluses with the CLP, the provision of reports to the CLP, and the monitoring and auditing of the cooperative by the CLP. The contract also specifies the contours of the Mondragon legal structure [see Ellerman and Pitegoff 1983; or Ellerman 1983] for the associated cooperative such as the democratic governance principle, the limited return to capital, the attachment of the membership rights to work in the firm, the membership fee, the individual capital accounts, the collective account, and the allocation of the positive and negative retained surpluses to the internal accounts.

The departmental structure of the CLP has evolved over its history. The principal division has always been the Banking Division (Division Economica). In 1969, the non-banking functions related to promoting and launching new cooperatives and consulting with the associated cooperatives were organized together in the Empresarial Division. There once was a Social Security Division, but in the early 70s it was split off as a separate cooperative, Lagun-Aro. Today, there are the two principal divisions, the Banking Division and the Empresarial Division, plus a smaller General Services Division concerned with building maintenance and land acquisition for the CLP. The bulk of the CLP workers are in the Banking Division. It performs all the usual functions of a modern savings bank such as computerized servicing of the depositors' accounts, managing the bank's portfolio of investments in short and long-term securities, making new loan decisions, and monitoring the existent loans.

The Empresarial Division of the CLP

The Empresarial Division makes the CLP unique in the world of development banking. The entrepreneurial experience of the early cooperative founders (such as the CLP director, Jose Maria Ormaechea) was institutionalized in the Empresarial Division. It has systematized the process of creating new firms so that, with the exception of a fishing cooperative in 1973 and two small cooperatives at the end of 1983, there have been no failures in the development of over a hundred cooperatives of various types. Just as the systematized

innovation of the modern scientific research laboratory represented a major organizational advance over garage inventors, so the institutionalization of entrepreneurship in the Empresarial Division of the CLP represents a quantum leap over isolated and unorganized small business entrepreneurs. In the United States, roughly 8 out of 10 small business startups fail within five years.

The entrepreneurial function involves more than the design and launching of new enterprises. Entrepreneurship is also involved in any major departure from routine management in an existing enterprise such as entering new markets, launching new products, major expansions (or contractions), changeovers in equipment and technology, and in corporate reorganizations and turnarounds. The Empresarial Division institutionalizes entrepreneurship in this broad sense that includes both new launches and major non-routine changes in existing cooperatives.

There are currently about 150 staff members in the Empresarial Division. It is organized into seven areas, some of which are divided into departments:

1. Studies Area (Estudios):
   * Research Department
   * Library and Documentation Center Department,

2. Agricultural/Food Promotion Area (Promocion Agroalimentaria):
   * Agricultural/Food Department

3. Industrial Promotion Area (Promocion Industrial):
   * Products Department,
   * Promotion Department,

4. Intervention Area (Intervencion):
   * Intervention Department,

5. Consulting Area (Asesoramiento):
   * Export Department,
   * Marketing Department,
   * Production Department,
   * Personnel Department,
   * Administrative-Financial Department,
   * Legal Department,

6. Auditing and Information Area (Auditoria e Informacion):
   * Auditing Department,
   * Information and Control Department,

7. Urban Planning Area (Urbanismo y Edificaciones):
   * Urban Planning Department,
   * Industrial Building Department, and
   * Housing Department.

The CLP Annual Business Plan Manual

The business development experts in the Empresarial Division have systematized and documented in CLP publications much of the general business advice and specific operational practice developed in the Mondragon cooperatives. The most ambitious business manual developed by the Empresarial Division is the 286-paged Plan de Gestion Anual de la Empresa ("Annual Management Plan for the Enterprise"), hereafter known as "the CLP manual." The inhouse manual was so well-received that it was eventually typeset, published by Ediciones Vascas-Argitaletxea (1978), and sold to the general public.

It is this annual business plan manual that is the basis for the present monograph. In particular our focus is on Part I which deals with the development of the management plan, as opposed to Part II which is concerned with controlling the implementation of the plan. The CLP manual combines overall business advice with the development of a specific numerical example of an annual business plan. Some of the business advice is relative to the Spanish commercial environment so it is not relevant to an American company. The general business advice is, for the most part, available in numerous American books on management accounting and business planning.

Our focus is on developing a specific practical example of an annual business plan for a worker cooperative. This monograph does not attempt to cover the general field of management planning. The general discussion is concerned with the distinctively cooperative aspects of the plan, e.g., the treatment of direct labor as a fixed cost. There is also some comment on certain non-standard accounting concepts (e.g., total costing and theoretical profit on production) which are not particularly related to the cooperative nature of the company.

Only the general structure of the numerical example used in the CLP manual is incorporated here. The numbers, the business characteristics, and the other particulars have all been reworked for an American worker cooperative using the ICA/Mondragon legal structure [see ICA Model By-laws for a Worker Cooperative - Version II, 1983]. Thus this monograph is not written for scholars curious about the particulars of the CLP manual. The document itself should be consulted for that information. Whenever there was a choice between remaining faithful to the specifics of the CLP manual or making the presentation useful in the American context, the latter was chosen.

The CLP manual is not particularly explicit about the cooperative nature of the company being modelled. There might be several reasons:

(1) sound business advice and practice is usually the same for both cooperative and conventional companies,
(2) the CLP business experts are more practitioners than theoreticians, and
(3) the CLP manual was sold to the general public where it might be used by conventional firms.

In particular, there is little explicit discussion in the prose portion of the CLP manual on the major change due to the cooperative nature of the firm, the treatment of direct labor as a fixed cost. That treatment is briefly discussed in the analysis of the breakeven point, but that is a side calculation outside the main flow of the business plan from the sales and manufacturing budgets to the operating and cash budgets and the balance sheets.

The major impact of treating direct labor as a fixed cost is in the manufacturing budget. In that budget, the projected manufacturing output is derived from the number of working hours of the members during the year. This is totally different from the conventional derivation of production from sales. The difference is not emphasized in the prose portion of the text, and one diagram (page 10) misleadingly presents the manufacturing budget as if it was derived from sales. Thus our job has been to analyze more what the CLP manual actually does rather than what it says.

Direct Labor as a Fixed Cost

In conventional management accounting, indirect labor (e.g., supervisors) and general and administrative labor (managers and support staff) are treated as

fixed costs. Direct labor is treated as a variable cost. Direct workers are assumed to be hired and fired as demand warrants. This may or may not be a description of how all conventional companies operate. It is nevertheless built into the logical structure of conventional managerial accounting. Direct labor is not treated as an exogenous given quantity. It is conventionally treated as an endogenously determined variable: sales together with desired levels of inventory investment determine production, and production determines the direct labor requirements (e.g., 2 hours per unit).

It is that last link which is reversed in a cooperative. Labor determines production (e.g., 1/2 unit per hour), rather than vice-versa. The cooperative membership of direct workers is a given for short-term planning (e.g., annual business plans). Within certain limits, the membership of direct workers determines the level of production. Production together with sales determined the level of inventory investment -- which may or may not be the desired level. This leads to what will be called "the matching problem."

Since

Inventory Investment = Production - Sales,

any two of these three quantities determines the third. In conventional management accounting, sales and desired inventory investment determine production which, in turn, determines direct labor. Since direct labor and thus production are, within certain limits, given independently of sales in a cooperative, the three quantities of production, sales, and desired inventory investment might not match up to satisfy the foregoing equation. That is the matching problem. The matching problem will be further discussed when the annual plan is developed (Part II below), but a general discussion is appropriate here.

The "fixity" of fixed costs should not be overemphasized. A cost can only be characterized as fixed or variable relative to a time frame and relative to a range of variation. In the long run, all costs are variable. It is in the short run, such as a one year planning horizon, that direct labor is a fixed cost in a cooperative. In a longer planning horizon, e.g., five year plans, direct, indirect, and managerial labor are all variable in certain degrees.

Direct labor is more fixed in the downward than upward direction. The assumption about the cooperative membership structure is that all workers, after a limited probationary period, are either accepted into membership or rejected from membership and terminated. Thus all permanent workers are members. It is further assumed that membership may not be terminated for short-term economic reasons such as periodic drops in demand. But brisk and stable demand may lead to the admission of new members in the short run. Indeed the annual plan presented below projects ten new members as direct workers in the expanding line of production for product B. Thus the membership of direct workers is fixed downward, not fixed upwards, so it might be more accurate to call it "semi-fixed."

The major variability in "labor as a fixed cost" is the fact that it is membership which is fixed (or semi-fixed), not working hours. Thus overtime and its opposite "undertime" are always possibilities. And they are possibilities for all members, direct, indirect, and managerial workers. Moreover, the workers are the members and thus residual claimants of the cooperative so the workers' income is, in part, determined by the uncertain fortunes of the firm. Although a fixed level of paid-out labor income ("wages") has been assumed, bad times could always lead to midcourse corrections such as reductions in paid-out income.

While "undertime" and "underpay" are possibilities in a worker cooperative, the point is that the annual and longer-term plans should be used to minimize the likelihood of such drastic measures. One consequence of treating labor as a fixed cost is to increase the importance of the planning process. When annual planning is poorly done in a conventional enterprise, the laid-off direct workers tend to pay the price. Direct labor is the principal escape valve. But when the membership of the direct workers is a given constraint, managment planning does not have the same leeway. Faced with a drop in demand, cooperative management would cut price rather than production.

The independent determination of "Production" in the equation

$$\text{Inventory Investment} = \text{Production} - \text{Sales}$$

emphasizes the importance of making "Sales" a dependent variable as much as possible. Cooperative management should attempt to compensate for the fixity of

labor and thus of production by making sales more variable, more under the control of management's price-cutting and sales efforts.

It is interesting to note that, for a variety of social reasons beyond our present scope, many of the people involved in the American and foreign worker cooperative movements show considerable disdain for the whole area of marketing, advertising, and sales efforts. But we have seen that this de-emphasis on marketing in worker cooperatives should be precisely reversed. Marketing should be more important in worker cooperatives, not less important. Instead of treating sales as an outside-determined variable given by the market, management should maximize the cooperative's control over the volume of sales to offset the fixity of labor. There is reason to believe that the worker-members' identification with their product would lead not only to higher quality products but to more dignified and accurate product advertising. But, be all that as it may, cooperative production should lead management to put more emphasis on the sales effort, not less.

The Structure of the Budgets

The treatment of direct labor as a fixed cost changes the logical order and interconnection of the individual budgets which make up the master budget or management plan. Two basic budget structures will be described:

(1) conventional budget structure where sales and desired inventory investment determine production which, in turn, determines the direct labor usage, and
(2) cooperative budget structure where direct labor determines production independently of sales.

The conventional structure for budgets is exhibited in a simplified schematic form in Diagram #1, and the cooperative structure is similarly exhibited in Diagram #2.

The difference lies in the order of determination of the manufacturing inventory of finished goods, production, and direct labor. Since

Inventory Investment = Ending Inventory - Beginning Inventory,

we have

Ending Inventory - Beginning Inventory = Production - Sales.

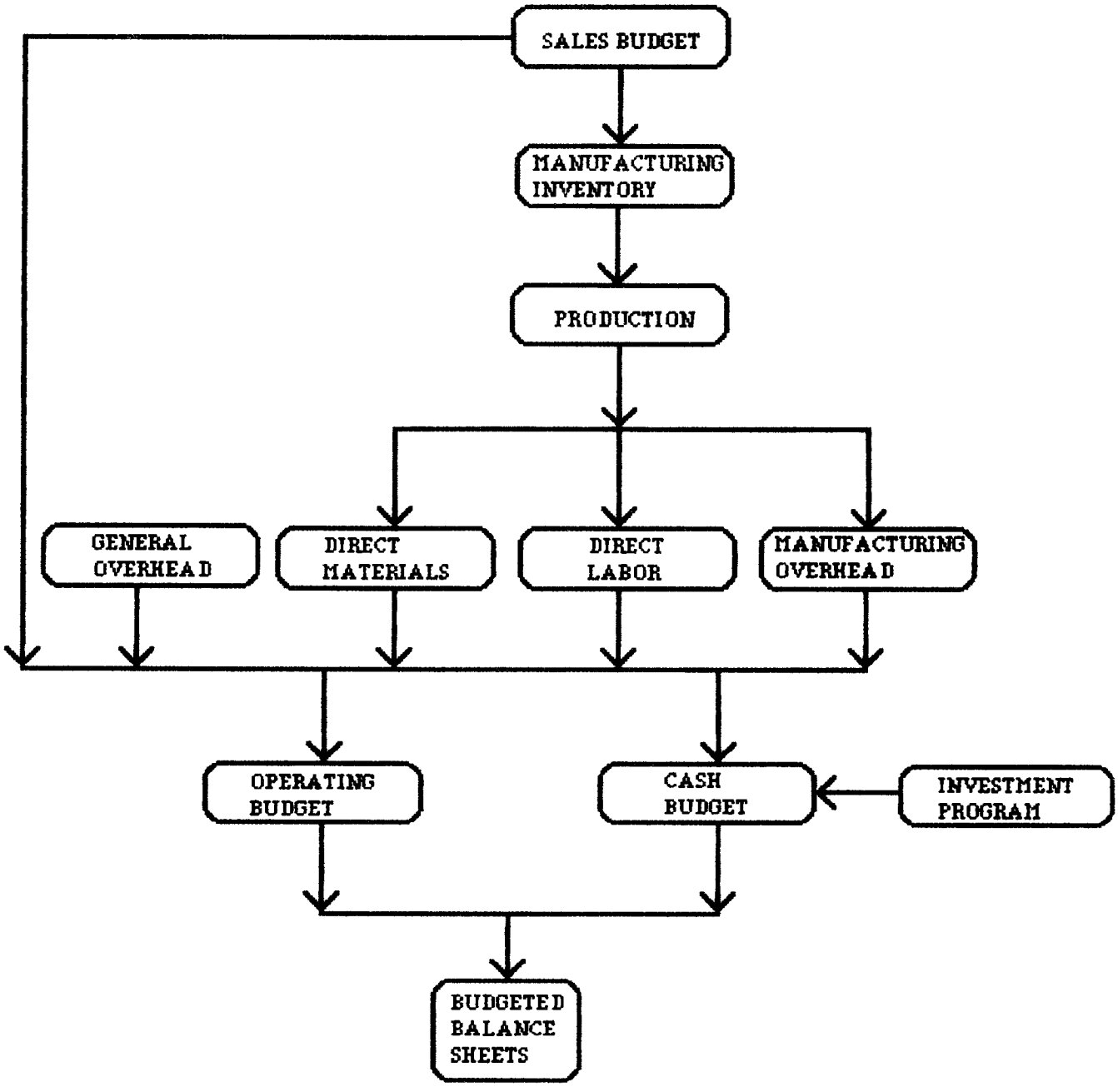

DIAGRAM # 1: CONVENTIONAL BUDGET STRUCTURE

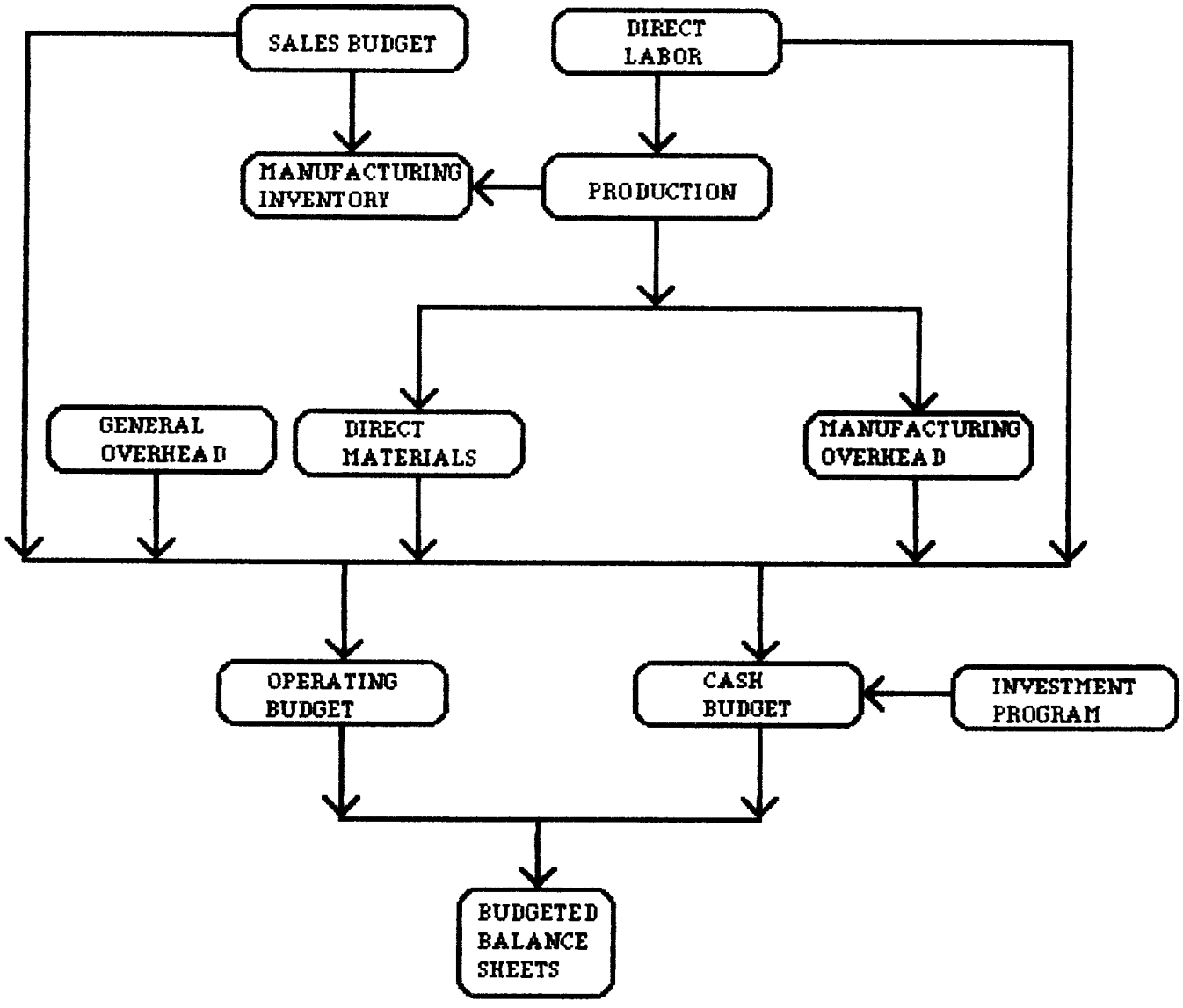

DIAGRAM #2: COOPERATIVE BUDGET STRUCTURE

In the conventional structure, production is determined by the other quantities:

Production = Sales + Ending Inventory - Beginning Inventory.

There is usually a desired level of ending inventory, such as ten percent of the next month's sales, so the sales budget and the desired inventory levels determine the level of production as indicated in Diagram #1. Then production determines the required direct labor (e.g., 3 hours per unit). As stated in a typical managerial accounting text:

> The direct labor budget is also developed from the production budget. Direct labor requirements must be computed so that the company will know if sufficient labor time is available to meet production needs. By knowing in advance just what will be needed in the way of labor time throughout the budget year, plans can be developed to adjust the labor force as the situation may require. Firms that neglect to budget run the risk of facing labor shortages or having to hire and fire at awkward times. Erratic labor policies lead to insecurity and inefficiency on the part of employees [Garrison 1982, p. 300].

In the cooperative structure, the given direct labor determines the level of production (e.g., 1/3 unit per hour). Then the sales budget and the given level of beginning inventory determine the ending level of finished goods inventory:

Ending Inventory = Production - Sales + Beginning Inventory.

The matching problem is the problem of getting the projected inventory levels equal to the desired or intended levels. In the numerical example of the CLP manual, there was precisely zero inventory investment over the year of the plan. This could not be a coincidence. Clearly management had adjusted, behind the scenes, the selling price, the sales effort and/or the direct labor hours (e.g., overtime/undertime or non-replacement of quits) to yield the desired result.

Note in Diagram #2 that the sales budget has no direct role in the production budget (manufacturing program). The Sales Budget is given as Table #1 (p. 29) in the CLP manual. The Manufacturing Program or Production Budget is given as Table #2 (p. 42). Sales nowhere appear in the Manufacturing Program.

Instead, the Manufacturing Program (production budget) is derived from the number of direct labor hours present in each month of the working year.

The labor-to-production direction of determination also receives support from the text.

> Obviously, the specification of products by months will start from the study of productive capacity carried out by the Production Director, based on the number of hours to be worked in the Working Year.
>
> [Obviamente, la especificacion de los productos por meses partira del estudio de la capacidad productiva realizada por el director de Produccion, acomodandose a las horas a trabajar que se estimen segun el Calendario Laboral. (p. 34)]

In the treatment of the manufacturing program, CLP manual explicitly states that the variation in inventory levels is computed from production and sales -- whereas production is conventionally computed from sales and desired inventory levels.

> To try to evaluate the variations in stocks, it is necessary to compare the production forecasts for each month with the budgeted sales invoices.
>
> In this specific instance, the distinctive objectives set in successive monthly periods are expressed as a function of the productive hours which are derived from the working year, ...
>
> [Para tratar de evaluar las variaciones de existencia, es de rigor comparar, las previsiones productivas en cada mes con las facturaciones presupuestadas.
>
> En el caso concreto, las distintos objetivos encuadrados en los sucesivos tramos mensuales son recogidos en funcion de las horas productivas que vienen senaladas por el calandario laboral, ...
> (p. 43)]

Labor as a Fixed Cost in Conventional Firms

The worker-owned cooperative corporation [Ellerman and Pitegoff 1983] is a third type of firm fundamentally different from the capitalist corporation or the government-controlled socialist firm. It applies the idea of democracy to the workplace, and it institutionalizes the natural efficiency and justice of people getting the full fruits of their labor [see Ellerman 1984].

Many conventional firms have simulated certain features of worker-owned firms without changing the ownership structure. For over a century, there have been waves of fashionable programs which try to bring labor into a more member-like position without altering the ownership structure of the corporation. These programs include profit-sharing, worker participation, job enrichment, autonomous workteams, quality of working life, and quality circle programs. All simulate various aspects of worker ownership, and thus attempt to stimulate the natural efficiency and productivity of people jointly working for themselves.

Conventional firms tend to simulate as a "program" what is institutionalized as a structural characteristic in a worker-owned cooperative. The treatment of labor as a fixed cost is a structural feature of a worker-owned cooperative. Thus we should expect a long-term trend in conventional firms to mitigate the insecurity of direct labor by treating direct labor more and more as a fixed cost. Some firms are presently moving in this direction due to the high costs of layoffs and the scarcity of direct labor with appropriate skills or firm-specific knowledge.

The lifetime employment programs in the core Japanese industrial firms have been widely publicized -- with less mention of the huge periphery of small unstable firms which do much of the subcontracting for the core firms. The job security of the lifetime workers in the core firms gives the workers a membership-like identification with the firm, an identification unavailable to employees who get the pinkslip whenever demand slumps. And one can daily read of American workers trading economic gains for job security (e.g., auto industry) and of American corporations granting such privileges to promote workers' identification with the firm.

This trend towards treating direct labor as a fixed cost in conventional firms does not seem to have reached the literature on management accounting and

business planning. John Stuart Mill was always careful to distinguish between the technically determined conditions of production and the structure of human institutions. The standard business literature treats the variability of direct labor more as a technical fact than as an institutional characteristic. This planning monograph for cooperative firms outlines an alternative to the standard treatment of direct labor. It is also relevant to conventional firms seeking to treat the direct workers as if they were members of the firm.

The Ward Model of a Self-Managed Firm

The cooperative treatment of labor as a fixed factor is also relevant to a theory of the worker-managed firm current in academic economics. The model was developed by Ward [1958, 1967], Domar [1966], and Vanek [1970]. It is sometimes called the "Illyrian firm" (although Yugoslav economists and most other self-management theorists now reject the model).

The Ward model provides an interesting episode in academic economics. Professional economists spend considerable time and effort mastering the analytical mathematical machinery of conventional economic theory. Like a child with a hammer who sees everything as a nail, academic economists tend to only see models that are appropriate for their analytical tools. In particular, the analytical tool used to predict the behavior of an economic agent (e.g., a consumer or a firm) is the maximization of an objective function. For the consumer, it is the consumer's utility function, and for the conventional firm, it is the profit function. Yet multi-person democratic decision-making is not reducible to a simplistic one-dimensional maximization problem. Hence for analytical (not to mention political) reasons, conventional economists avoid modelling a democratic worker-owned cooperative.

Instead economists use the Ward model of a self-managed firm. The model arose from a number of remarkable assumptions which force the model into the preconceived mold of maximizing a single function. It is assumed that workers have no freedom to vary the number of working hours, and that working conditions are all determined by the given technology. Thus in modelling the one type of firm where workers have ultimate control of the work and working conditions, the model assumes these matters are given and fixed. All that remains is the financial return, the labor income, which the workers would maximize if all else

is fixed. The assumptions so far would lead to a model of a self-managed firm as maximizing the total labor income of the fixed set of worker-members.

The Ward model then makes the distinctive assumption that members would be terminated in response to short-run price fluctuations if that would increase the labor income of the surviving members. Thus the Ward model portrays a self-managed firm which would maximize the labor income per surviving member. Given this 'perverse' assumption, that membership is a short-run discretionary economic variable, it is not surprising that Ward, Domar, and others were able to derive some 'perverse' behavior for the model, e.g., a backward-bending supply curve under certain conditions. This makes the model doubly attractive to conventional economists. Instead of building serious models of democratic worker-owned cooperatives, economists can work with the Ward model which is not only analytically tractable in a simplistic way but exhibits 'perverse' results.

One should not assume that empirical facts have any particular relevance to academic model-building. The models discussed in the academic journals have a curious life of all their own. In any case, it is within the scope of our present work to note that the Mondragon cooperatives consciously assume that membership is <u>not</u> a short-run discretionary variable. The basic planning manual for this most noteworthy group of worker cooperatives constructs the enterprise plan on the assumption that labor is a fixed cost. And with that assumption, the perverse results of the Ward model disappear.

Electronic Spreadsheets

The drafting of business plans has recently been revolutionized by the introduction of electronic spreadsheets. This instrument is so well-suited for the drafting of plans and is so widely available on any personal computer that we must assume an electronic spreadsheet is being used for the annual business plan. In this day and age, there simply is no other way to do it. In particular, the numerical example given below was developed in VisiCalc on a 128K Apple IIe. Any other electronic spreadsheet could be used as well. To accomodate the whole plan in one file, the computer should start with at least 85K of free RAM to capture the level of detail in the numerical example.

All the tables are given with row and column borders so each cell can be referred to by its position in the large spreadsheet. Little attention has been

paid to the actual keystrokes used to enter the model since that would depend on the spreadsheet program being used. Only a few non-trivial formulas are described in detail. This monograph does not attempt to teach spreadsheeting itself; it is assumed that the user is already familiar with the use of an electronic spreadsheet.

The Hypothetical Cooperative Enterprise

The year of the annual business plan (1984) is the second year of operation of the firm as a cooperative. It was converted from a conventional firm, and it started with 70 members. The firm manufactures two products which are simply known as A and B. Product A was the standard product for the firm in the past. But product A does not have high technology content; it is rapidly becoming outmoded. Hence the company in the past year introduced product B which is a high-tech and high-margin version of the product. In the plan year, 12 more members are brought into the production of B to gearup for its expanding markets. Product B along with A is to be aggressively marketed in new territories as indicated by the sales discounts offered in the last months of the plan year. Production exceeds sales during the plan year to build up the inventory for the future sales in these new outlets. The other details of the enterprise will unfold as the annual business plan is developed in Part II.

The particulars of the hypothetical enterprise have been changed from the practical example developed in the CLP manual. The practical example developed here is solely for didactic or educational purposes. The important points are the logical connections between the various parts of the plan and the level of attention to detail. The specific numbers are only for illustrative purposes; little or no attention has been paid to making the numbers realistic.

PART II: THE ANNUAL BUSINESS PLAN

The Sales Budget

In a conventional (non-cooperative) firm, the sales budget is the basis for the rest of the budgetary process. It is a sales-driven process. Direct labor is hired or fired according to whether the sales go up or down. A cooperative is different in that members may not be fired simply because sales go down. This complicates the managerial function in a cooperative. If the number of members is given and the length of the working day is fixed, then the number of units produced is determined within certain limits independently of sales. If sales are largely outside the influence of management, then undesired discrepencies between sales and production can arise. The production side of this matching problem will be further discussed in the context of the manufacturing budget.

The sales side of the matching problem highlights the need to maximize management's control over the volume of sales. Conventional management might accept a drop in sales as given and respond by cutting back on production and laying-off workers. Cooperative management might respond to the same drop by cutting prices or increasing the sales effort, e.g., increasing advertising, increasing discounts, or seeking new sales outlets.

In the present model, there is little problem with product B. It has an expanding market as it becomes better known and as the sales force penetrates new territories. The long-range strategic plan for the cooperative calls for the expansion of the productive capacity for B in the plan year to satisfy increased sales in the plan year and subsequent years. The constraint on cooperative management is one-sided. New members may be added if the sales expansion for product B is long-termed. Several such increases are incorporated in the later personnel budget.

Product A is more problematic. It is facing a declining share in its older markets. In the plan year this decline is largely compensated for by the new markets opened up by the aggressive sales program for product B. But that pattern may not hold very far beyond the plan year. Hence no increased capacity is planned for A in spite of the mild (but probably temporary) upward sales trend. The worker-members who leave in the normal process of turnover (quitting

or retirement) are replaced but there is no net increase in the production force for product A.

There is a considerable literature on sales forecasting due to the prominence of the sales budget in the planning process. The CLP manual mentions a number of techniques. Subjective methods include: (1) executives' forecasts based on intuition and past experience, (2) forecasts by sales personnel based on knowledge of their local areas, and (3) forecasts based on consumer surveys, panels, and interviews. Market surveys by specialists must be relied upon when there is little past experience as in a new product launch.

In a going-concern with past experience, the CLP manual favors a method called the "moving average trend" method. The moving average method is illustrated in the following table used to arrive at the sales forecasts for product A in terms of physical units.

	A	B	C	D	E	F	G	H	I
1	SALES FORECAST: MOVING AVERAGE METHOD								
2									
3		PAST			MOVING	PLAN	PROJ.	TOTAL SALES	ROUNDED
4		AVERAGE		ACTUAL	AVE.	YEAR	SALES	times	TO
5	MONTH:	PERCENT	MONTH #	SALES	SALES	MONTH #	PLAN YR	PERCENT	100's
6	JAN	8.26	1	3150	3500	13	3787	3898	3900
7	FEB	8.05	2	3850	3550	14	3813	3798	3800
8	MARCH	7.84	3	3650	3500	15	3840	3698	3700
9	APRIL	8.05	4	3000	3550	16	3866	3798	3800
10	MAY	8.05	5	4000	3550	17	3892	3798	3800
11	JUNE	8.47	6	3650	3650	18	3918	3998	4000
12	JULY	8.47	7	3300	3650	19	3944	3998	4000
13	AUGUST	8.26	8	4000	3550	20	3971	3898	3900
14	SEPT	8.26	9	3350	3600	21	3997	3898	3900
15	OCT	8.47	10	3450	3650	22	4023	3998	4000
16	NOV	8.69	11	4150	3750	23	4049	4098	4100
17	DEC	9.11	12	3650	3900	24	4076	4298	4300
18							-----		-----
19						TOTAL	47176	TOTAL	47200

The number of units sold in each past year is totaled, and then the percent of sales in each month over total sales is computed. If this is done for several years, the percents are averaged for each January, for each February, and so forth. Thus one arrives at a percent for each month which expresses the average seasonal variations in sales. In the Sales Forecast table above, these percents are given in column B.

The sales for several past years might be used to find the monthly percentages. However, in the example, only the sales figures from the most recent year are used to project the sales trend (as opposed to the monthly fluctuations) for the plan year.

The sales data is first smoothed by computing a moving average to show the trend beneath the seasonal fluctuation. The smoothed sales for each month is the average of the sales for the previous month, the month itself, and the following month. For example,

Smoothed FEB Sales = (JAN Sales + FEB Sales + MARCH Sales)/3

At the beginning and end of the year, only two months are used in the average. Thus

Smoothed JAN Sales = (JAN Sales + FEB Sales)/2

and similarly for December. The smoothed sales are computed in column E.

The sales trend is projected into the future using simple linear regression. The independent variable is the month number in column C and the dependent variable is the smoothed sales data in column E. Any elementary statistics text can be consulted for the necessary formulas or a scientific hand-held calculator can be used. The resulting regression line is

Projected Sales = 3446 + 26.22(Month Number).

Then one inserts the month numbers for the plan year, namely 13 through 24, into the regression line to compute the projected sales for those months. The results are given in column G. The monthly figures are not as important as the total for the year because the monthly amounts were extrapolated from smoothed or averaged data.

The total projected sales for the plan year (47176 units of A) is multiplied times the monthly percents to arrive at column H. Then the sales figures in column H are rounded to the nearest hundreds to finally arrive at the sales forecast (column I) in terms of physical units of product A. These figures are used in the Sales Budget (Table #1). The unit price ($29.00) is assumed to be determined by market data.

Managers should always examine sales projected by statistical methods for inituitive plausibility. A sales budget is a sales forecast backed by the management's commitment to realize the forecast. Management cannot escape the responsiblity for meeting the sales budget by using an 'objective' statistical method of forecast.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	TABLE #1: SALES FORECASTS MONTHLY														
2	----------														
3		MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
4	PROD.A @	29.00													
5	Quantity Sold		3900	3800	3700	3800	3800	4000	4000	3900	3900	4000	4100	4300	47200
6	Gross Sales		113100	110200	107300	110200	110200	116000	116000	113100	113100	116000	118900	124700	1368800
7	-Discounts		0	0	0	0	0	0	0	0	0	4640	4756	4988	14384
8	----------		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
9	Sales		113100	110200	107300	110200	110200	116000	116000	113100	113100	111360	114144	119712	1354416
10															
11	PROD.B @	62.00													
12	Quantity Sold		400	440	450	450	475	500	500	500	550	700	740	740	6445
13	Gross Sales		24800	27280	27900	27900	29450	31000	31000	31000	34100	43400	45880	45880	399590
14	-Discounts		0	0	0	0	0	0	0	0	0	1736	1835	1835	5406
15	----------		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
16	Sales		24800	27280	27900	27900	29450	31000	31000	31000	34100	41664	44045	44045	394184
17															
18		TOTALS MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
19	Product A		113100	110200	107300	110200	110200	116000	116000	113100	113100	111360	114144	119712	1354416
20	Product B		24800	27280	27900	27900	29450	31000	31000	31000	34100	41664	44045	44045	394184
21	----------		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
22		TOTALS	137900	137480	135200	138100	139650	147000	147000	144100	147200	153024	158189	163757	1748600

A similar statistical method could be used to arrive at the sales forecast for product B. However a more active sales campaign is envisioned for product B. Hence extrapolations from past sales are modified to reflect the aggressive sales efforts. In the later months of the plan year, this effort is also reflected in the discounts given on both products.

The spreadsheet file using the moving average method is not a part of the spreadsheet model which starts with Table #1 and contains the remainder of the annual business plan. The numbers from the moving average spreadsheet are transferred (by hand or electronically, e.g., using DIF files) to Table #1 (e.g., row 5 for product A).

The formulas used in Table #1 are straightforward. Gross sales are computed as sales price (e.g., in cell B4 for product A) times quantity sold. From past experience discounts are estimated at 4% of gross sales in the last three months of the plan year when sales agents are pushing into new territories. Otherwise, the formulas for the monthly and annual totals are clear from the printout of Table #1. The product totals on rows 19 and 20 are pulled down from the prior calculations. For instance, the formula in cell C19 is the cell reference +C9.

The Manufacturing Program

In a conventional firm, indirect and managerial labor is treated as a fixed or semi-fixed cost. Within a range of variation in demand, indirect labor is not reduced with a drop in demand. Since there is less constraint on increasing than decreasing indirect labor, it might be called a "semi-fixed" cost.

In a cooperative, the preferential treatment normally accorded to indirect labor is extended to all the membership, direct as well as indirect labor. Cooperative direct labor is a semi-fixed factor, fixed within a range for a drop in demand.

This difference in the standard operating procedures of conventional and cooperative firms leads to basic differences in the respective manufacturing programs of the firms. Thus both types of programs will be described and contrasted.

There is a standard equation which occurs in many guises throughout accounting and economics, the stock/flow equation. A stock quantity (not to be confused with shares of stock) is a quantity with a value at a point in time while a flow quantity gives the change in some stock quantity over a period of time. In accounting, an account which records a stock quantity could be called a stock account but is usually called a "permanent account" (e.g., balance sheet accounts). An account recording a flow quantity could be called a flow account but is usually called a "temporary account" (e.g., income statement accounts). For example, cash is a stock account while cash receipts (cash inflow) and cash disbursements (cash outflow) are flow accounts. The general stock/flow equation for some time period states that the net change in the stock levels (ending stock minus beginning stock) is equal to the net inflow (inflow minus outflow):

STOCK/FLOW EQUATION

Ending Stock Level - Beginning Stock Level = Inflow - Outflow.

In the present section, the stock accounts are the final goods inventories of manufactured products A and B. The outflow is sales and the inflow is production so

Ending Final Goods - Beginning Final Goods = Production - Sales.

The equation can be stated in terms of physical quantities or dollar amounts.

In the conventional treatment of the manufacturing budget, production is determined by solving the above equation for that amount:

Production = Ending Final Goods - Beginning Final Goods - Sales.

Typically a desired level of ending inventory is computed as a percent (say 10%) of the next period's forecast sales:

Production = 10% of Next Period Sales - Beginning Final Goods - Sales.

Hence in the conventional treatment, production is driven by sales (given the initial inventory level).

In the cooperative treatment, production is labor-driven, not sales-driven. Indeed, in the CLP manual's manufacturing program, presented here in slightly modified form as Table #2, the quantity of sales does not even appear explicitly (just as sales does not appear in the conventional projection of fixed costs).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
25	TABLE #2:		M A N U F A C T U R I N G			P R O G R A M									
26															
27		MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
28	WORKING DAYS:		20	20	22	20	22	21	21	22	20	22	21	19	250
29	PRODUCT A:														
30	Direct Workers		50	50	50	50	50	50	50	50	50	50	50	50	
31	Hours Present		8000	8000	8800	8000	8800	8400	8400	8800	8000	8800	8400	7600	100000
32	Prod. Hours(95%)		7600	7600	8360	7600	8360	7980	7980	8360	7600	8360	7980	7220	95000
33	Units Prod 1/2hr		3800	3800	4180	3800	4180	3990	3990	4180	3800	4180	3990	3610	47500
34	D.Labor@	7.75	62000	62000	68200	62000	68200	65100	65100	68200	62000	68200	65100	58900	775000
35	Sales Value		110200	110200	121220	110200	121220	115710	115710	121220	110200	121220	115710	104690	1377500
36															
37	PRODUCT B:														
38	Direct Workers		10	10	10	10	15	15	15	15	15	20	20	20	
39	Hours Present		1600	1600	1760	1600	2640	2520	2520	2640	2400	3520	3360	3040	29200
40	Prod.Hours(95%)*		1520	1520	1672	1520	2112	2394	2394	2508	2280	2948	3192	2888	26948
41	Units Prod 1/3hr		507	507	557	507	704	798	798	836	760	983	1064	963	8983
42	D.Labor@	8	12800	12800	14080	12800	21120	20160	20160	21120	19200	28160	26880	24320	233600
43	Sales Value		31413	31413	34555	31413	43648	49476	49476	51832	47120	60925	65968	59685	556925
44															
45	Total Prod.Hours		9120	9120	10032	9120	10472	10374	10374	10868	9880	11308	11172	10108	121948
46	Total Dir.Labor		74800	74800	82280	74800	89320	85260	85260	89320	81200	96360	91980	83220	1008600
47	Total Sales Val.		141613	141613	155775	141613	164868	165186	165186	173052	157320	182145	181678	164375	1934425
48															
49	(* New workers 50% productive 1st month & then 95%)														
50															
51															
52	TABLE #3: MANUFACTURING SUMMARY (SALES VALUE)														
53		MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
54	Value A@	29.00	110200	110200	121220	110200	121220	115710	115710	121220	110200	121220	115710	104690	1377500
55	Value B@	62.00	31413	31413	34555	31413	43648	49476	49476	51832	47120	60925	65968	59685	556925
56	Manufact. Total		141613	141613	155775	141613	164868	165186	165186	173052	157320	182145	181678	164375	1934425

Instead of being derivative from sales, the cooperative production planning process could be considered parallel or co-equal to the sales budgeting process.

Production planning begins with the given cooperative membership and any planned increases. The calender and holiday schedule are used to compute the number of working days in each month (row 28 in Table #2). The given number and planned increases in workers performing direct labor ("direct workers") are given in rows 30 and 38 in the two lines of production. Each working day is assumed 8 hours long so

Hours Present = 8 x Direct Workers x Working Days.

The CLP manual mentions the opposite effects of absenteeism and overtime but assumes they will roughly cancel so that absenteeism and overtime can be ignored in the plan. Past experience indicates that, on average, 5% of the hours present are unproductive so

Productive Hours = 95% of Hours Present.

The only exception is for new workers in the production of B. They are assumed to be only 50% productive in the first month of work. For example, in May there are 10 older workers and 5 new workers for a total of:

8 x 15 x 22 = 2640 hours present.

But the productive hours are

(95% of 8 x 10 x 22) + (50% of 8 x 5 x 22) = 2112 productive hours.

The relation between direct labor and production is given by fixed proportions known from past operations:

1/2 unit A per direct labor hour or 2 hours per unit A
1/3 unit B per direct labor hour or 3 hours per unit B.

Thus the number of units manufactured is computed from the productive direct labor hours. For example, in January there are 7600 productive hours spent on A so 3800 = 7600/2 units of A are produced. There is a slightly different labor rate on the two types of labor due to the technical difficulties involved in producing B:

$7.75 an hour on product A
$8.00 an hour on product B.

Thus the direct labor cost is the rate of pay times the hours present. The sales value is the sales price pulled down from Table #1 times the number of units produced.

Table #3 simply repeats the sales value of the manufactured amounts of the two product lines and computes their sum in the manufacturing total.

The Matching Problem

The stock/flow equation highlights the matching problem between production and sales. The difference between the ending and beginning inventory levels is the net investment in inventory:

Inventory Investment = Ending Inventory - Beginning Inventory.

By the stock/flow equation, the investment in inventory equals the gap between production and sales:

Inventory Investment = Production - Sales.

In this equation, each quantity can be interpreted as being actual or budgeted.

The matching problem can be stated as the problem of making the equation hold using the budgeted amounts:

Budgeted Inventory Investment = Budgeted Production - Budgeted Sales.

Given the sales and manufacturing budgets, the resulting inventory investment (or disinvestment) might not equal the budgeted, intended, or desired level. For example, if no net change in inventory is desired, then budgeted production has to equal budgeted sales.

In the numerical example, there is net inventory investment. This is acceptable due to the anticipated jump in sales following the penetration of new sales territories. In the year following the plan year, inventory investment should be curtailed.

There are a number of techniques available to cooperative management to vary the budgeted amounts to satisfy the equation:

Budgeted Inventory Investment = Budgeted Production - Budgeted Sales.

In the previous section, the emphasis was on the importance of management's control over budgeted sales. There are also methods of changing budgeted production even though the membership of direct workers is treated as a semi-fixed variable.

In the medium-term, direct labor can be reduced through attrition, non-replacement of direct workers who quit or retire.

In the short-term, overtime and perhaps subcontracting are options. If demand is cyclical, direct labor could be staffed only up to the low point or trough in the cycle. When demand is higher, overtime is the first option but then some work might be subcontracted out. When demand drops, the subcontracting and overtime is cut back. This is quite consistent with the subcontractors being cooperatives which function as flexible job-shops for a number of surrounding cooperative manufacturers.

In a federation or group of cooperatives, the same effect can be obtained by shifting workers between cooperatives. Unless the cycles or seasonal fluctuations for the various cooperatives are in lockstep, the redundant direct workers in one cooperative can temporarily work in a cooperative facing brisk demand. This is one of the many risk-pooling advantages of federating cooperatives together.

The downward constraint on cooperative management is membership, not hours or pay. If necessary, "undertime" (the opposite of overtime) and/or "underpay" are possibilities. Undertime is a shortening of the workday or workweek, and underpay is the reduction in the pay to all the members for the same work. Organized labor is strongly opposed to such practices in conventional firms where the employees and the employer are, in part, locked into a zero-sum game (one's loss is the others gain).

In a cooperative firm, the workers are also the members so it is a fundamentally different situation. At the risk of some oversimplification, a pay reduction in a cooperative is akin to taking money out of one pocket (pay) and putting it into the other pocket (year-end profits). If the revenue was there to be paid out in wages and salaries, then a pay reduction to avoid (say) a cashflow crisis will not destroy that value. The value is moved to the other

pocket of year-end profits which also directly or indirectly accrue to the same members. Undertime and underpay are drastic but powerful tools which cooperatives can and should use to survive in a competitive environment.

Cooperative management thus has a number of techniques available to modify budgeted production and sales to bring them in line with desired levels of inventory investment. The difficulty of this matching problem emphasizes the importance of the annual business planning process. It may well be necessary to try various scenarios or "iterations" before a business plan acceptable to the management and the membership as a whole is obtained.

Manufactured Products Inventories

Budgeted levels of production and sales together with the initial inventory yields the budgeted levels of inventory throughout the plan year. Table #3 states production valued at sales price so that in Table #4 production can be directly compared to sales to derive the budgeted inventory variation (inventory investment or disinvestment) at sales price (rows 63 and 72 for products A and B). This inventory variation is then multiplied times the cost/price ratio to obtain the inventory variation valued at cost (rows 65 and 74). That, together with the initial inventory level at cost, yields the inventory levels in terms of cost throughout the plan year (rows 67 and 76).

The CLP manual uses an unconventional notion of cost. Costs are usually classified into manufacturing costs, general and administrative costs, and selling costs. Manufacturing costs may be split into variable (or proportional) and fixed portions. The costs assigned to the final goods in inventory are product costs, which expire into expenses when the corresponding revenue is recognized, as opposed to period costs which expire when incurred. Direct costing and absorption or full costing are two methods of defining the product costs. Under direct costing,

product costs = variable manufacturing costs.

Under absorption costing,

product costs = variable and fixed manufacturing costs.

In neither case are the general and administrative costs (including indirect and managerial labor) treated as product costs.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
59	TABLE #4: INVENTORY TRENDS IN MANUFACTURED PRODUCTS														
60	PRODUCT A MONTH:		JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
61	Manu. A (@Sales)		110200	110200	121220	110200	121220	115710	115710	121220	110200	121220	115710	104690	1377500
62	Sales of Prod. A		113100	110200	107300	110200	110200	116000	116000	113100	113100	116000	118900	124700	1368800
63	Inv.Var.(@Sales)		-2900	0	13920	0	11020	-290	-290	8120	-2900	5220	-3190	-20010	8700
64	Cost% =	95.01													
65	Inv.Var.(@Cost)		-2755	0	13226	0	10470	-276	-276	7715	-2755	4960	-3031	-19012	8266
66	Prev.Month Inv.		4000	1245	1245	14470	14470	24940	24665	24389	32104	29349	34309	31278	4000
67	Ending Inventory		1245	1245	14470	14470	24940	24665	24389	32104	29349	34309	31278	12266	12266
68															
69	PRODUCT B MONTH:		JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
70	Manu. B (@Sales)		31413	31413	34555	31413	43648	49476	49476	51832	47120	60925	65968	59685	556925
71	Sales of Prod. B		24800	27280	27900	27900	29450	31000	31000	31000	34100	43400	45880	45880	399590
72	Inv.Var.(@Sales)		6613	4133	6655	3513	14198	18476	18476	20832	13020	17525	20088	13805	157335
73	Cost% =	80.64													
74	Inv.Var.(@Cost)		5333	3333	5366	2833	11449	14899	14899	16798	10499	14132	16199	11132	126872
75	Prev.Month Inv.		10000	15333	18666	24032	26865	38314	53213	68111	84910	95409	109541	125739	10000
76	Ending Inventory		15333	18666	24032	26865	38314	53213	68111	84910	95409	109541	125739	136872	136872
77															
78															
79	TABLE #5: PURCHASES AND USE PROGRAM: RAW MATERIALS														
80		MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
81	Raw Mat.Use A		19000	19000	20900	19000	20900	19950	19950	20900	19000	20900	19950	18050	237500
82	Raw Mat.Use B		4560	4560	5016	4560	6336	7182	7182	7524	6840	8844	9576	8664	80844
83	End.Inv.Raw Mat.		3534	3887	3534	4085	4070	4070	4264	3876	4462	4429	4007	4007	4007
84	-Beg.Inv.Raw Mat		3500	3534	3887	3534	4085	4070	4070	4264	3876	4462	4429	4007	3500
85	=Raw Mat.Purch.Q		23594	23913	25563	24111	27220	27132	27326	28036	26426	29711	29104	26714	318851
86	x Price	0.60													
87	=Raw Mat.Purch.$		14156	14348	15338	14467	16332	16279	16395	16822	15855	17827	17463	16028	191311
88	[Assumptions: 5 units RM per unit A; 9 units RM per unit B; Ending Inventory = 15% next month's use]														

In keeping with the cooperative attempt to breakdown the differential treatment of direct and indirect labor, the CLP manual defines a new notion of total costing:

product costs = manufacturing + general & administrative costs.

The only remaining costs, the selling costs, are charged directly against gross sales to obtain the net sales.

The total costs could also be computed by subtracting the net income or profit from the net revenue. However, in the CLP manual, two concepts of profit and revenue are computed: (1) the conventional profit where revenue is recognized on the basis of sales, and (2) a theoretical profit where revenue is realized on the basis of production [see Ellerman 1982A for a theoretical treatment of this revenue recognition rule]. This will be discussed further in the later section on the operating budget (projected income statement). In the second case, the (net) revenue is called "Production" (at sales value) and it is computed as the net sales plus the inventory investment at sales value. Thus the total cost of the goods produced could be computed as:

Total Cost = Production - Theoretical Profit.

The amounts for production and the theoretical profit will only be computed in a later section of the spreadsheet model so the Cost/Price ratio in this section will involve a "forward reference."

Forward references are tricky but are not easily avoided in this model. Formulas involving forward references usually will not have their proper values after only one recalculation. If there are several formulas involving forward references, then several recalculations may be necessary before the values stabilize. Moreover, when a model with forward references is first loaded from the disk, many cells will contain ERRORs. The user should keep recalculating the model until the ERRORs disappear and the numerical values stabilize.

The cost/price ratios in Table #4 are computed by the following formula:

cost/price = (Production - Theoretical Profit)/Production
= 1 - (Theoretical Profit/Production).

In the Table #14 Operating Budget, the value of Production for product A is in cell C217 and Theoretical Profit is in C244. Hence the cost/price ratio (as a percent) in cell B64 given by the formula:

100*(1-(C244/C217)).

Similarly, the cost/price ratio for product B is computed in B73 as:

100*(1-(E244/E217)).

In rows 65 (for A) and 74 (for B) of Table #4, the inventory variation valued at sales price is multiplied by the cost/price ratio (as a fraction obtained by dividing the percent by 100) to obtain the inventory variation in terms of cost. It will be useful to establish some notation for present and later uses:

P = Sales Price per unit (for any product such as A or B)
C = Total Cost per unit
Q = Number of Units Sold
dQ = Inventory Variation in physical units, and
Q+dQ = Production in physical units.

Thus the inventory variation at cost is calculated as

CdQ = Cost/Price Ratio x Inventory Variation at Sales Price
= (C/P)PdQ.

The beginning inventory at cost is added to the inventory at cost to yield, in rows 67 and 76, the ending inventory at cost. The beginning inventory at cost in January is an initial datum taken from the beginning balance sheet. The beginning inventory for each later month is the ending inventory from the prior month.

The Direct Materials Purchases and Uses Budgets

Tables #5, #6, and #7 give the purchases and uses budgets for the three types of direct materials: raw materials, purchased parts, and packaging. Table #8 gives the summary of the direct materials purchases.

When the stock/flow equation is applied to a direct materials inventory, the purchases are the inflow and the uses are the outflow. The use of the direct materials is technically determined by the manufacturing budget. Each

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
90	TABLE #6: PURCHASES AND USE PROGRAM: PURCHASED PARTS FOR A & B														
91	PROD. A	MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
92	Parts Used for A		7600	7600	8360	7600	8360	7980	7980	8360	7600	8360	7980	7220	95000
93	End.Inv. A Parts		1140	1254	1140	1254	1197	1197	1254	1140	1254	1197	1083	1083	1083
94	-Beg.Inv.A Parts		1000	1140	1254	1140	1254	1197	1197	1254	1140	1254	1197	1083	1000
95	= Part A Purch.Q		7740	7714	8246	7714	8303	7980	8037	8246	7714	8303	7866	7220	95083
96	x Price	0.75													
97	= Part A Purch.$		5805	5786	6185	5786	6227	5985	6028	6185	5786	6227	5900	5415	71312
98															
99	PROD. B	MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
100	Parts Used for B		1013	1013	1115	1013	1408	1596	1596	1672	1520	1965	2128	1925	17965
101	End.Inv. B Parts		152	167	152	211	239	239	251	228	295	319	289	289	289
102	-Beg.Inv.B Parts		100	152	167	152	211	239	239	251	228	295	319	289	100
103	= Part B Purch.Q		1065	1029	1099	1073	1436	1596	1607	1649	1587	1990	2098	1925	18154
104	x Price	1.20													
105	= Part B Purch.$		1278	1234	1319	1287	1723	1915	1929	1979	1904	2388	2517	2310	21785
106	[Assumptions: 2 A Parts per unit A; 2 B Parts per unit B; Ending Inventory = 15% next month's use]														
107															
108															
109	TABLE #7: PURCHASES AND USE PROGRAM: PACKAGING														
110		MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
111	Pack. A@	0.50	1900	1900	2090	1900	2090	1995	1995	2090	1900	2090	1995	1805	23750
112	Pack. B@	0.75	380	380	418	380	528	599	599	627	570	737	798	722	6737
113	End.Inv. Package		342	376	342	393	389	389	408	371	424	419	379	379	379
114	-Beg.Inv.Package		500	342	376	342	393	389	389	408	371	424	419	379	500
115	=Packaging Pur.$		2122	2314	2474	2331	2614	2594	2612	2680	2524	2822	2753	2527	30366
116															
117															
118	TABLE #8: SUMMARY PURCHASES PROGRAM														
119		MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
120	Raw Mat.Purchase		14156	14348	15338	14467	16332	16279	16395	16822	15855	17827	17463	16028	191311
121	Part A Purchases		5805	5786	6185	5786	6227	5985	6028	6185	5786	6227	5900	5415	71312
122	Part B Purchases		1278	1234	1319	1287	1723	1915	1929	1979	1904	2388	2517	2310	21785
123	Packaging Purch.		2122	2314	2474	2331	2614	2594	2612	2680	2524	2822	2753	2527	30366
124	----------		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------
125	Dir.Mat.Purchase		23362	23682	25315	23870	26897	26773	26964	27665	26069	29264	28632	26281	314774

unit of A requires 5 units of raw materials, and each unit of B requires 9 units of raw materials. The same type of raw material is used in both lines of production so there is only one raw materials inventory. The production of A and B in physical terms is given in rows 33 and 41 of Table #2, so 5 and 9 times those amounts gives the respective raw materials usage for A and B in rows 81 and 82 of Table #5.

The ending raw materials inventory is set at 15% of the next month's use (where, for simplicity, the November amount is repeated in December). The beginning raw materials inventory in dollar terms for January is taken from the beginning balance sheet. Dividing by the unit price yields the January beginning inventory in physical units. For later months, the beginning level is, of course, the ending level from the prior month. Then the inflow of purchases is determined by the stock/flow equation (all in physical terms)

Purchases = Ending Inventory - Beginning Inventory + Usage.

The raw material purchases are multiplied by the unit price (cell B86) to yield the raw material purchases in dollar terms.

Table #6 gives the inventories for the purchased parts for A and B. The parts are distinct for two products so two inventories are maintained. Two parts are required for each unit of A and B produced. Thus the usage of parts in physical terms is twice the production of the respective products. The ending inventory is again set at 15% of the next month's usage. The January beginning inventory can be obtained from the beginning balance sheet after dividing by the unit price (in cell B96 for A and B104 for B). The purchase of parts in physical terms is computed as usual using the stock/flow equation (rows 95 and 103). Multiplying by the unit price yields the purchases in dollar terms.

Table #7 gives the inventory for packaging. Packaging is used for both products but $.50 worth is used per unit A and $.75 worth per unit B. It is convenient to apply the stock/flow equation in Table #7 in dollar amounts. The usage of packaging for A and B (rows 111 and 112) is given in dollar terms by computing, respectively, $.50 times A production and $.75 times B production. The ending inventory is again 15% of the next month's usage. The beginning inventory for January is off of the initial balance sheet and, for later months,

it is the prior month's ending level. The purchases of packaging in dollar terms is then directly computed (row 115) using the stock/flow equation.

Table #8 adds up, in dollar terms, the purchases all the direct materials.

The Investment Program

Table #9 gives the terms of the scheduled capital investments and ancillary expenses during the plan year. Table #10 gives the timing of the investments, and Table #11 gives the timing of the cash payments.

	A	B	C	D	E	F	G	H
128	TABLE #9:		INVESTMENT AND AMORTIZATION PROGRAMS					
129	----------							
130			TERMS OF INVESTMENT PURCHASES					
131		ASSET	TERMS		COST			
132		Two Machines B	20% Down		15750	5 Yr.Amort		
133			80% Down	36 Mon	(7875	each)		
134		Prep.for Install	Payable	90 days	250	Manu.Ovhd.	for	B
135		Tooling for B	Payable	90 days	900	Manu.Ovhd.	for	B
136		Truck Gen. Use	20% Down					
137			80% Down	24 Mon	9000	5 Yr.Amort		
138								

Two machines are purchased for the production of B in the months of May and October when the extra workers are brought in to increase the production of B. Twenty percent of the purchase price is paid in the month of acquisition, and the remaining 80% is paid in equal payments over the next 36 months. For simplicity in planning, no interest is imputed on that payment plan. The audited financial statements for the cooperative might require such an interest imputation. Installation preparations for the machines are required in the month prior to acquisition. The cost is paid after 90 days, and it is charged off as an expense to manufacturing overhead.

Some tooling work (preparation of dies) is also required for product B in March. It is also paid after 90 days and charged as an expense to manufacturing overhead. The last investment is a pickup truck to be acquired in June and for general use in the firm. The terms are 20% down with 80% paid off in equal installments over 24 months. No interest is imputed on that financing plan. The two B machines and the truck are depreciated on a straight line basis over a five year period.

These assumptions are developed in numerical terms in Tables #10 and #11. Table #10 gives the times the assets are acquired or actions are performed. Table #11 gives the timing of the payments.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
140	TABLE #10:		INVESTMENT PROGRAM															
141		MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL			
142	Machines for B						7875					7875			15750			
143	Prep.for Install					125					125				250			
144	Tooling for B				900										900			
145	Truck							9000							9000			
146																		
147	Totals		0	0	900	125	7875	9000	0	0	125	7875	0	0	25900			
148																		
149																		
150																		
151	TABLE #11:		SCHEDULE OF INVESTMENT PAYMENTS														FUTURE YEARS	
152		MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL	1985	1986	1987
153	Prev. Investment														0			
154	Mach.#1	MAY					1575	175	175	175	175	175	175	175	2800	2100	2100	875
155	Mach.#2	OCT										1575	175	175	1925	2100	2100	1750
156	Prep.#1	APRIL							125						125			
157	Prep.#2	SEPT												125	125			
158	Tooling	MARCH						900							900			
159	Truck	JUNE						1800	300	300	300	300	300	300	3600	3600	1800	
160																		
161	Totals		0	0	0	0	1575	2875	600	475	475	2050	650	775	9475	7800	6000	2625

Personnel Program

The table labelled "Planned Increases in Personnel" specifies the budgeted changes in membership during the plan year. It is estimated that one member will leave from the division producing A every three months. To maintain the level of A production, these members are replaced. It is assumed that the new workers in the production of A have normal efficiency. Two groups of new B workers are scheduled in May and October. Each group consists of 5 direct workers and one supervisor. There are four salary levels in the company. The direct workers are at level 1 and the supervisors are at level 2.

The table labelled "Planned Personal Changes" details the arrivals and departures in each month of the plan year.

Table #12 gives the distribution and salary levels of all the workers in the firm at the end of the plan year. In addition to the direct workers and supervisors in the A and B divisions, there is one salesperson for each division, the general manager and an office person. The base pay of the direct workers in divisions A and B is $15,500 and $16,000 respectively. The supervisors and office person are at salary level 2 ($19,000), the sales people are at level 3 ($15,000 + commissions), and the manager is at level 4 ($35,000).

Table #13 breaks down the total labor costs between the two divisions. All the labor except the general and administrative labor is performed in one of the divisions. The G&A expense is pro-rated between the two divisions according to their projected sales.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
163	PLANNED INCREASES IN PERSONNEL:														
164	ENTRY DATE	DIV	CATEGORY		SALARY LEV.	NOTES									
165	JAN 1	A	Direct Labor		1	Normal Replacement									
166	APRIL 1	A	Direct Labor		1	Normal Replacement									
167	MAY 1	B	Direct Labor		1	Five new workers									
168	MAY 1	B	Indirect	Labor	2	One new supervisor			19000x8	mon.=	12768				
169	JULY 1	A	Direct Labor		1	Normal Replacement									
170	OCT 1	A	Direct Labor		1	Normal Replacement									
171	OCT 1	B	Direct Labor		1	Five new workers									
172	OCT 1	B	Indirect	Labor	2	One new supervisor			19000x3	mon.=	4712				
173															
174															
175	PLANNED PERSONNEL CHANGES (normal turnover + expansion)														
176	MONTH:	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC		
177	Arrivals	1	0	0	1	6	0	1	0	0	7	0	0		
178	Departures	1	0	0	1	0	0	1	0	0	1	0	0		
179	Difference	0	0	0	0	6	0	0	0	0	6	0	0		
180	Begin. of Month	70	70	70	70	70	76	76	76	76	76	82	82		
181	End of Month	70	70	70	70	76	76	76	76	76	82	82	82		

TABLE #12: DISIRIBUTION OF PERSONNEL BY SECTIONS AND THE ANNUALIZED BUDGET EXPENSE (end of the year levels)

	DIVISION A						DIVISION B						GENERAL AND		TOTAL	
SALARY LEVEL	Direct Labor Number	Direct Labor Salary	Indirect Labor Number	Indirect Labor Salary	Sales Number	Sales Salary	Direct Labor Number	Direct Labor Salary	Indirect Labor Number	Indirect Labor Salary	Sales Number	Sales Salary	ADMINISTRATIVE Number	ADMINISTRATIVE Salary	Number	Salary
1	50	775000					20	320000							70	1095000
2			4	76000					4	76000			1	19000	9	171000
3					1	15000					1	15000			2	30000
4													1	35000	1	35000
	50	775000	4	76000	1	15000	20	320000	4	76000	1	15000	2	54000	82	82

TABLE #13: PERSONNEL BUDGET IN RELATION TO OPERATING BUDGET

Category	Division A	Division B	Total
Direct Labor	775000	320000	1095000
Indirect Labor	76000	55480	131480
Sales	15000	15000	30000
Gen. & Admin.	41827	12173	54000(Pro Rated by Sales)

The Operating Budget: Totals

Table #14 is the operating budget using annual totals, the projected or pro forma annual income statement for the firm. The operating budget broken down into months is given later (Tables #15 and #16).

The total sales figures (after discounts) for A and B are pulled down from Table #1. In columns D, F, and H the entries in rows 207-215 of the Operating Budget are expressed as percentages of Sales. Thereafter, the accounts are expressed as percentages of Production at Sales. The commissions are 2% of sales and the allowance for uncollectible accounts receivable is estimated at 1% of sales. The inventory variations for A and B are pulled down from Table #4. The production at sales value is computed as the net sales plus the inventory variation at sales value. Net Sales is the revenue when revenue is recognized on a sales basis, and Production at sales value is the revenue when revenue is recognized on a production basis [see p. 4 and p. 18 of Ellerman 1982 for a discussion of the production revenue-recognition rule].

The direct labor expense is obtained from Table #2, and the payroll taxes (social security, unemployment taxes, and workers' compensation) are estimated at 10%. The raw materials use in physical terms is given in Table #5. Multiplying by the price (cell B86) yields the raw materials expense in row 223 of the operating budget. Note that all the raw materials and other direct materials which are used are expensed. This allows the computation of the theoretical profit based on recognizing revenue on a production basis. A correction, the "Revalued Stock Difference," is applied to compute the conventional net income which counts as expense only the direct materials used in the products sold.

The physical usage of purchased parts is obtained from Table #6 so multiplication by the prices yields row 224 of the operating budget. The packaging usage in Table #7 is already in dollar terms so it can be directly pulled down to row 225. The variable or proportional manufacturing costs are summed in row 227 of the Operating Budget.

The indirect labor totals are pulled down from Table #13, and the payroll taxes are estimated at 10%.

In Division A, $20,000 of machines are being depreciated (always straight-line) over five years so $4,000 is the manufacturing depreciation for A.

	A B	C	D	E	F	G	H
205	TABLE #14:	OPERATING BUDGET:		TOTALS			
206	ACCOUNTS:	Div. A	%	Div. B	%	Total	%
207	Sales	1354416	100	394184	100	1748600	100
208							
209	Var.Sales Costs:						
210	Commissions	27088	2	7884	2	34972	2
211	Allow. Bad A/R	13544	1	3942	1	17486	1
212							
213	Net Sales	1313784	97	382358	97	1696142	97
214							
215	Inv. Investment	8700		157335		166035	
216	@Sales						
217	Production	1322484	100	539693	100	1862177	100
218	@Sales						
219	MANU. COSTS:						
220	Proportional:						
221	Direct Labor	775000	59	233600	43	1008600	54
222	Payroll Taxes	77500	6	23360	4	100860	5
223	Raw Materials	142500	11	48506	9	191006	10
224	Purchased Parts	71250	5	21558	4	92808	5
225	Packaging	23750	2	6737	1	30487	2
226							
227	Var.Manu. Costs	1090000	82	333762	62	1423762	76
228	Fixed:						
229	Indirect Labor	76000	6	55480	10	131480	7
230	Payroll Taxes	7600	1	5548	1	13148	1
231	Manu. Deprec.	4000	0	4594	1	8594	0
232	Other	0	0	1150	0	1150	0
233							
234	Gr. Manu. Margin	144884	11	139160	26	284043	15
235	GENERAL OVERHEAD						
236	Gen.Admin.Salary	41827	3	12173	2	54000	3
237	Gen.Admin.Costs	3486	0	1014	0	4500	0
238	Sales Salaries	15000	1	15000	3	30000	2
239	Payroll Taxes	5683	0	2717	1	8400	0
240	Depreciation	7010	1	2040	0	9050	0
241	Interest	4354	0	1267	0	5622	0
242	Misc.	1549	0	451	0	2000	0
243	Theoret. Profit						
244	on Production	65975	5	104497	19	170472	9
245							
246	Revalued Stock						
247	Difference	-434	0	-30464	-6	-30898	-2
248	Net Income	65541	5	74033	14	139574	7

In Division B, before the new purchases, there were two B machines each worth $7,875 and being depreciated over 5 years. Hence the monthly depreciation on each machine is $7,875/(5 x 12) = $131.25. The annual manufacturing depreciation on those original two machines is

$$2 \times 12 \times \$131.25 = \$3,150.$$

Another B machine is purchased at the same price in May so its depreciation in the plan year is 8 x $131.25 = $1,050. The fourth B machine is purchased in October so its depreciation is 3 x $131.25 = $394 (rounded). Hence the total is

$3,150 = 24 x $131.25 = Depreciation on original two B machines
$1,050 = 8 x $131.25 = Depreciation on May B machine
$ 394 = 3 x $131.25 = Depreciation on October B machine

$4,594 = Manufacturing Depreciation for Division B

The "Other" fixed manufacturing expenses in Division B were $250 installation preparations for the two new B machines and $900 tooling work for a total of $1150.

The Gross Manufacturing Margin (row 234) is obtained by subtracting both the variable and fixed manufacturing costs from Production at sales value.

In Table #13, the General and Administrative Salaries were pro-rated between the two divisions according to sales so those amounts can be pulled down to row 236 of the Operating Budget. The General and Administrative Costs (e.g., bookkeeping), estimated at $4,500, are also apportioned to the divisions on a sales basis. The salaries of the sales people are obtained from Table #13. The payroll taxes, computed in row 239, are estimated at 10% of the sum of G&A salaries and sales salaries.

The General Overhead Depreciation comes from the building and the truck purchased in June. The original cost of the building was $80,000. The building is depreciated over a 10 year period for a $8,000 depreciation charge. The truck costs $9,000 and is depreciated over 5 years. Thus the monthly charge is 9000/(5 x 12) = $150, so seven months (June-December) depreciation is $1,050. Thus the total General Overhead Depreciation is

$8,000 = 80,000/10 = building depreciation
$1,050 = 7 x 9,000/(5 x 12) = truck depreciation

$9,050 = General Overhead Depreciation

The total is pro-rated to the divisions on a sales basis and is entered on row 240 of the Operating Budget.

The total interest on row 241 arises from the original long-term debt of $50,000 at 12% over five years plus a new line of credit with the local bank. The monthly amortization payment on the long-term debt is $1,112.22. The most elementary method of splitting this into principal and interest portions is to make each principal portion equal. Thus the monthly principal part is

$$\$50,000/(5 \times 12) = \$833.33$$

and the interest portion is

$$\begin{array}{r} \$1,112.22 \\ - \ 833.33 \\ \hline \$ \ \ 278.89 \end{array}$$

Hence the annual interest payment on the long-term debt is calculated as

$$12 \times \$278.89 = \$3,347 \text{ (rounded)}$$

The remaining interest payment of $2,275 comes from the line of credit interest computed on row 168 of Table #19, the Cash Budget (projected cashflow statement). The interest depends on the amount borrowed in the line of credit which depends on the cash balance -- which in turns partially depends on the interest payments. Hence there is circularity involved in determining the interest payments. The spreadsheet model should be recalculated several times until the numbers stabilize. The total interest of $5,622 (= 3,347 + 2,275) is apportioned between the divisions on a sales basis.

The Miscellaneous General Overhead expense of $2,000 is an estimate from past experience, and it is also apportioned according to sales.

The Theoretical Profit on Production is computed as the Gross Manufacturing Margin minus the sum of the General Overhead expenses. Using our previous notation,

P = net sales price per unit
C = total cost per unit
Q = number of units sold
dQ = inventory investment in physical units
$Q+dQ$ = production in physical units,

we have

$$\text{Theoretical Profit on Production} = P(Q+dQ) - C(Q+dQ) = PQ - CQ + (P-C)dQ.$$

But conventional financial accounting computes the profit as the

$$\text{Net Income} = PQ - CQ.$$

The difference is the

$$\underline{\text{Revalued Stock Difference}} = (P-C)dQ.$$

The Revalued Stock Difference is subtracted from the Theoretical Profit to arrive at the Net Income on "the bottom line," row 248, of the Operating Budget.

To calculate the Revalued Stock Difference, the revaluation P-C is

$$\begin{aligned} &\text{Sales Price x Theoretical Profit / Production} \\ &= P \times (P-C)(Q+dQ)/(P(Q+dQ)) \\ &= P-C \end{aligned}$$

The physical inventory variation dQ is

$$\text{Inventory Variation at Sales / Sales Price} = PdQ/P = dQ$$

Thus we have

$$\begin{aligned} &\text{Revalued Stock Difference} \\ &= \text{Investment Variation at Sales x Theoretical Profit / Production} \end{aligned}$$

That completes Table #14, the operating budget using annual totals. It is at the bottom left of the spreadsheet model. The remainding tables, Tables #15 through #21, start at the top right and proceed down the right-hand side of the spreadsheet (columns T through AH).

The Monthly Operating Budget

Tables #15 and #16 give the monthly operating budgets for divisions A and B respectively. For many accounts, the monthly values can be computed from the prior monthly budgets (Sales, Manufacturing, etc.). In some cases, the annual total for the division is apportioned to the months on the basis of the number of working days in the month. And in some other cases, the annual total is simply split evenly across the months.

The explanation of the monthly operating budgets will be focused on Table #15, the operating budget for Division A. Except as otherwise noted, the budget for Division B will be constructed in a similar manner. The Total Sales on row 4 (columns V-AG) of Table #15 is obtained from row 9 of Table #1 (columns C-N), the monthly sales budget. The commissions and allowances for bad accounts

	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
2	TABLE #15:		MONTHLY OPERATING BUDGET: DIVISION A												
3	MONTH:		JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
4	Total Sales		113100	110200	107300	110200	110200	116000	116000	113100	113100	111360	114144	119712	1354416
5															
6	Var.Sales Costs:														
7	Commissions 2%		2262	2204	2146	2204	2204	2320	2320	2262	2262	2227	2283	2394	27088
8	Allow. Bad AR 1%		1131	1102	1073	1102	1102	1160	1160	1131	1131	1114	1141	1197	13544
9															
10	Net Sales		109707	106894	104081	106894	106894	112520	112520	109707	109707	108019	110720	116121	1313784
11															
12	Inv. Investment		-2900	0	13920	0	11020	-290	-290	8120	-2900	5220	-3190	-20010	8700
13	@Sales														
14	Production		106807	106894	118001	106894	117914	112230	112230	117827	106807	113239	107530	96111	1322484
15	@Sales														
16	MANU. COSTS:														
17	Proportional:														
18	Direct Labor		62000	62000	68200	62000	68200	65100	65100	68200	62000	68200	65100	58900	775000
19	Payroll Taxes		6200	6200	6820	6200	6820	6510	6510	6820	6200	6820	6510	5890	77500
20	Raw Materials		11400	11400	12540	11400	12540	11970	11970	12540	11400	12540	11970	10830	142500
21	Purchased Parts		5700	5700	6270	5700	6270	5985	5985	6270	5700	6270	5985	5415	71250
22	Packaging		1900	1900	2090	1900	2090	1995	1995	2090	1900	2090	1995	1805	23750
23															
24	Var.Manu. Costs		87200	87200	95920	87200	95920	91560	91560	95920	87200	95920	91560	82840	1090000
25	Fixed:														
26	Indirect Labor		6080	6080	6688	6080	6688	6384	6384	6688	6080	6688	6384	5776	76000
27	Payroll Taxes		608	608	669	608	669	638	638	669	608	669	638	578	7600
28	Manu. Deprec.		333	333	333	333	333	333	333	333	333	333	333	333	4000
29	Other		0	0	0	0	0	0	0	0	0	0	0	0	0
30															
31	Gr. Manu. Margin		12586	12673	14391	12673	14304	13314	13314	14217	12586	9629	8614	6584	144884
32	GENERAL OVERHEAD														
33	Gen.Admin.Salary		3346	3346	3681	3346	3681	3513	3513	3681	3346	3681	3513	3179	41827
34	Gen.Admin.Costs		279	279	307	279	307	293	293	307	279	307	293	265	3486
35	Sales Salaries		1200	1200	1320	1200	1320	1260	1260	1320	1200	1320	1260	1140	15000
36	Payroll Taxes		455	455	500	455	500	477	477	500	455	500	477	432	5683
37	Depreciation		584	584	584	584	584	584	584	584	584	584	584	584	7010
38	Interest		348	348	383	348	383	366	366	383	348	383	366	331	4354
39	Misc.		124	124	136	124	136	130	130	136	124	136	130	118	1549
40	Theoret. Profit														
41	on Production		6250	6337	7480	6337	7393	6691	6691	7306	6250	2718	1990	535	65975
42															
43	Revalued Stock														
44	Difference		170	0	-882	0	-691	17	17	-503	170	-125	59	111	-434
45															
46	Net Income		6419	6337	6597	6337	6702	6708	6708	6802	6419	2593	2049	647	65541

	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
49	TABLE #16:		MONTHLY OPERATING BUDGET: DIVISION B												
50	MONTH:		JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
51	Total Sales		24800	27280	27900	27900	29450	31000	31000	31000	34100	41664	44045	44045	394184
52															
53	Var.Sales Costs:														
54	Commissions 2%		496	546	558	558	589	620	620	620	682	833	881	881	7884
55	Allow. Bad AR 1%		248	273	279	279	295	310	310	310	341	417	440	440	3942
56															
57	Net Sales		24056	26462	27063	27063	28567	30070	30070	30070	33077	40414	42723	42723	382358
58															
59	Inv. Investment		6613	4133	6655	3513	14198	18476	18476	20832	13020	17525	20088	13805	157335
60	@Sales														
61	Production		30669	30595	33718	30576	42765	48546	48546	50902	46097	57939	62811	56529	539693
62	@Sales														
63	MANU. COSTS:														
64	Proportional:														
65	Direct Labor		12800	12800	14080	12800	21120	20160	20160	21120	19200	28160	26880	24320	233600
66	Payroll Taxes		1280	1280	1408	1280	2112	2016	2016	2112	1920	2816	2688	2432	23360
67	Raw Materials		2736	2736	3010	2736	3802	4309	4309	4514	4104	5306	5746	5198	48506
68	Purchased Parts		1216	1216	1338	1216	1690	1915	1915	2006	1824	2358	2554	2310	21558
69	Packaging		380	380	418	380	528	599	599	627	570	737	798	722	6737
70															
71	Var.Manu. Costs		18412	18412	20253	18412	29251	28999	28999	30380	27618	39378	38665	34983	333762
72	Fixed:														
73	Indirect Labor		3040	3040	3344	3040	5016	4788	4788	5016	4560	6688	6384	5776	55480
74	Payroll Taxes		304	304	334	304	502	479	479	502	456	669	638	578	5548
75	Manu. Deprec.		263	263	263	263	394	394	394	394	394	525	525	525	4594
76	Other		92	92	101	92	101	97	97	101	92	101	97	87	1150
77															
78	Gr. Manu. Margin		8559	8484	9422	8466	7501	13790	13790	14510	12977	10579	16502	14580	139160
79	GENERAL OVERHEAD														
80	Gen.Admin.Salary		974	974	1071	974	1071	1023	1023	1071	974	1071	1023	925	12173
81	Gen.Admin.Costs		81	81	89	81	89	85	85	89	81	89	85	77	1014
82	Sales Salaries		1200	1200	1320	1200	1320	1260	1260	1320	1200	1320	1260	1140	15000
83	Payroll Taxes		217	217	239	217	239	228	228	239	217	239	228	207	2717
84	Depreciation		170	170	170	170	170	170	170	170	170	170	170	170	2040
85	Interest		101	101	112	101	112	106	106	112	101	112	106	96	1267
86	Misc.		36	36	40	36	40	38	38	40	36	40	38	34	451
87	Theoret. Profit														
88	on Production		5779	5705	6382	5686	4460	10880	10880	11469	10197	7538	13592	11931	104497
89															
90	Revalued Stock														
91	Difference		-1246	-771	-1259	-653	-1481	-4141	-4141	-4694	-2880	-2280	-4347	-2914	-30464
92															
93	Net Income		4533	4934	5122	5033	2979	6739	6739	6775	7317	5258	9245	9017	74033

receivable are estimated at 2% and 1% of sales respectively. The Net Sales is the total sales minus the commissions and allowances for bad A/R.

Sales in physical terms is given in Table #1 (row 5) and production in physical units is given in Table #2 (row 33). The difference between production and sales in physical units times the sales price gives the inventory investment at sales value in row 12 of Table #15. Production at Sales is computed in row 14 as the sum of Net Sales and Inventory Investment at Sales. It should be noted that the sales value of the units produced (row 35 of Table #2) differs from Production at Sales because the latter has the commissions and allowances for bad A/R taken out.

The monthly direct labor is obtained from Table #2. The monthly raw materials usage in physical units (row 81 of Table #5) is multiplied by the unit price (cell B86) to yield the monthly raw materials usage in row 20 of the Monthly Operating Budget. The monthly usage of purchased parts in physical units is taken from row 92 of Table #6 and multiplied by its unit price to yield the monthly purchased parts usage in row 21 of Table #15. In Table #7, the usage of packaging is already expressed in monetary units so it can be directly used in the Monthly Operating Budget. The Variable Manufacturing Costs are summed row 24.

The annual total for indirect labor is divided between the months according to the number of working days in the months. The Manufacturing Depreciation is split evenly between the months. The Gross Manufacturing Margin is Production at Sales minus all the manufacturing costs (variable and fixed).

All the General Overhead expenses, with the exception of Depreciation, are apportioned between the months according to working days. The Depreciation is split evenly.

The Theoretical Profit on Production is the Gross Manufacturing Margin minus the General Overhead. The Revalued Stock Difference is computed each month as

Revalued Stock Difference
= Investment Variation at Sales x Theoretical Profit / Production.

Subtracting the Revalued Stock Difference from the Theoretical Profit yields the Net Income each month.

Table #16, the Monthly Operating Budget for Division B, is computed in a similar fashion. There were no Other expenses in Division A, but in B the total Other expenses are split between the months according to the working days.

Breakeven Analysis

The breakeven level of sales, BESales, is the level at which the company or division just reaches the zero level of profit. To calculate the breakeven point, the total costs TC must be divided into the variable costs VC and the fixed costs FC: TC = VC + FC. At any level of sales S, the amount left after covering the variable costs to contribute towards covering the fixed costs and towards profits is the

$$\underline{\text{contribution margin}} = S - VC.$$

Dividing by the level of sales S gives the contribution of each dollar of sales towards fixed costs and profits:

$$\underline{\text{unit contribution margin}} = UCM = (S - VC)/S = 1 - (VC/S)$$

Thus the level of sales necessary to breakeven (i.e., just cover the fixed costs FC) is

$$BESales = FC/UCM = FC/((S - VC)/S) = FC*S/(S - VC)$$

BREAKEVEN FORMULA

In conventional management accounting, the variable costs VC are the variable manufacturing costs (direct labor and direct materials) in addition to the selling costs. But in the cooperative context, the membership status of all the workers implies treating all the workers, direct, indirect, sales, and G&A workers, as fixed charges for short-run analysis. Hence, when the CLP manual applies the breakeven formula, the direct labor costs are treated as part of the fixed costs FC. The variable costs VC include only the direct materials costs (raw materials, purchased parts, and packaging) and the selling costs. The remaining costs, direct labor costs, fixed manufacturing costs, and general overhead costs, are the fixed or "structural" costs FC.

Table #17 applies the cooperative direct-labor-as-a-fixed-cost breakeven formula to the plan year.

	T	U	V	W	X	Y	Z	AA
96	TABLE #17:			BREAKEVEN ANALYSIS				
97				DIVISION A		DIVISION B	TOTAL	
98			Amount	%	Amount	%	Amount	%
99	Sales		1354416	100.00	394184	100.00	1748600	100.00
100								
101	Var. Sales Costs		40632	3.00	11826	3.00	52458	3.00
102	Var. Raw Mat.		141600	10.45	34803	8.83	176403	10.09
103	Var. Purch.Parts		70800	5.23	15468	3.92	86268	4.93
104	Var. Packaging		23600	1.74	4834	1.23	28434	1.63
105	Gross Margin		1077784	79.58	327253	83.02	1405037	80.35
106	(w/o dir. labor)							
107	Structural Costs:							
108	Direct Labor		852500	62.94	256960	65.19	1109460	63.45
109	Fixed Manu.Costs		87600	6.47	66772	16.94	154372	8.83
110	General Overhead		78909	5.83	34663	8.79	113572	6.50
111								
112	Tot.Struct.Costs		1019009	75.24	358395	90.92	1377403	78.77
113								
114	P&L Results		58775	4.34	-31142	-7.90	27633	1.58
115								
116	Breakeven Sales							
117	FC*S/(S-VC)		1280555	94.55	431694	109.52	1714209	98.03

The Sales figures are net of discounts and can be drawn from Table #1 or Table #14. The Variable Sales Costs (commissions and allowances for bad A/R) are summed from the Operating Budget, Table #14. The variable manufacturing costs must be newly computed because they relate only to the goods sold. For instance the Variable Raw Materials cost is computed as the physical number of units sold (Table #1) times the number of units of raw material per unit A (i.e., five per unit as in Table #5) times the price per unit of raw materials (Table #5). In a similar manner, the variable costs for the purchased parts and packaging is computed only for the units sold. These variable costs are less than those previously computed because there was inventory investment in both divisions during the plan year (more production than sales).

The Gross Margin, S - VC in the breakeven formula, is computed on row 105 of Table #17 by subtracting the sum of the variable costs from sales.

The fixed or structural costs FC are computed as the sum of Direct Labor (which includes payroll taxes), Fixed Manufacturing Costs (Table #14), and General Overhead costs (Table #14).

The "P&L Results," computed on row 114, is the Gross Margin minus the Total Structural Costs. It is yet another profit notion which differs from the Net Income and the Theoretical Profits previously considered. Unlike Theoretical Profits, it counts only the Sales as revenue. Unlike Net Income, it counts all the fixed costs (now including direct labor) as an expense. Net Income treated the fixed costs as product costs (using total costing) so some of those costs are unexpired at the end of the plan year due to the inventory investment. Thus in a year of inventory investment, the P&L Results would be less than the Net

Income (as is evident, particularly in Division B with its heavy inventory investment).

Using the labels in Table #17, the breakeven formula yields

BESales = Total Structural Costs x Sales / Gross Margin.

In Division A, breakeven occurred at 94.55% of the actual sales. In Division B, the actual sales did not reach the breakeven point which was 109.52% of the actual sales. However, the enterprise as a whole did reach breakeven at 98.03% of the actual sales. This low level of profit is not too surprising because the B sales in the plan year did not cover the buildup of direct labor and other fixed costs in anticipation of enlarged future sales of B. Table #14 shows the rate of theoretical profit on production in Division B is a hefty 19% so the problems lie more in sales than production.

The Cash Collections Schedule

Past experience allows some simple assumptions to be made about the cash collections from sales. Fifty percent of sales are collected in the month of the sales. Forty-nine percent is collected in the next month, and the remaining 1% is written-off in the allowance for bad accounts receivable.

Table #18 gives the schedule of cash collections from sales based on these assumptions. In December of the year prior to the plan year, sales were $100,000. Fifty percent or $50,000 was collected in December and 1% or $1,000 was written-off. The remaining $49,000 is listed as the accounts receivable on the initial balance sheet and it is collected in January of the plan year.

In column U of Table #18, the sales for both A and B are listed. Then in the column under each month, 50% is assumed collected in the month of the sales and 49% in the next month. In each column for a month (V through AG), the cash collections for the month are summed in row 137 of Table #18. The 49% from the December sales will go on the year-end balance sheet as the accounts receivable.

The Cash Budget

Table #19 gives the cash budget or projected cashflow statement for the plan year. The Sales Receipts on row 143 are pulled down directly from Table #18, the Cash Collections Schedule.

	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
120	TABLE #18:		CASH	COLLECTIONS			SCHEDULE								
121			JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	END A/R
122	A/R DEC.	49000	49000												
123	SALES:														
124	JAN	137900	68950	67571											
125	FEB	137480		68740	67365										
126	MARCH	135200			67600	66248									
127	APRIL	138100				69050	67669								
128	MAY	139650					69825	68429							
129	JUNE	147000						73500	72030						
130	JULY	147000							73500	72030					
131	AUGUST	144100								72050	70609				
132	SEPT	147200									73600	72128			
133	OCT	153024										76512	74982		
134	NOV	158189											79094	77513	
135	DEC	163757												81878	80241
136															
137	TOTAL		117950	136311	134965	135298	137494	141929	145530	144080	144209	148640	154076	159391	

	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
140	TABLE #19:		CASH	BUDGET											
141			JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT	OCT	NOV	DEC	TOTAL
142	CASH-IN:														
143	Sales Receipts		117950	136311	134965	135298	137494	141929	145530	144080	144209	148640	154076	159391	1699873
144															
145	CASH-OUT:														
146	Direct Labor A		62000	62000	68200	62000	68200	65100	65100	68200	62000	68200	65100	58900	775000
147	Direct Labor B		12800	12800	14080	12800	21120	20160	20160	21120	19200	28160	26880	24320	233600
148	Indirect Labor A		6333	6333	6333	6333	6333	6333	6333	6333	6333	6333	6333	6333	76000
149	Indirect Labor B		3167	3167	3167	3167	4763	4763	4763	4763	4763	6333	6333	6333	55480
150	Gen.Admin.Salary		4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	54000
151	Sales Salaries		2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	30000
152	Payroll Taxes		9130	9130	9878	9130	10742	10336	10336	10742	9930	11603	11165	10289	122408
153	Commissions		2758	2750	2704	2762	2793	2940	2940	2882	2944	3060	3164	3275	34972
154	Dir.Mat.Purchase		24000	23362	23682	25315	23870	26897	26773	26964	27665	26069	29264	28632	312493
155	Gen.Admin.Costs		360	360	396	360	396	378	378	396	360	396	378	342	4500
156	Investment PMTs		0	0	0	0	1575	2875	600	475	475	2050	650	775	9475
157	Interest		279	279	279	279	279	279	279	279	279	279	279	279	3347
158	Loan Prin. PMTs		833	833	833	833	833	833	833	833	833	833	833	833	10000
159	Misc.		160	160	176	160	176	168	168	176	160	176	168	152	2000
160															
161	Cash-Out		128820	128174	136728	130139	148080	148062	145663	150163	141942	160493	157547	147464	1723275
162															
163	Net Cash Flow		-10870	8137	-1763	5159	-10586	-6134	-133	-6083	2267	-11853	-3471	11927	-23402
164	Beg.Cash	12000													
165	Cash B4 Finance		1130	20267	10367	17488	1839	6706	12436	6140	15194	1042	9296	24798	-11402
166															
167	Credit Line Finance:														
168	Interest (15%yr)		0	138	38	63	0	138	213	213	300	275	425	475	2275
169	Net Borrowing		11000	-8000	2000	-5000	11000	6000	0	7000	-2000	12000	4000	-12000	26000
170	Balance Due		11000	3000	5000	0	11000	17000	17000	24000	22000	34000	38000	26000	26000
171	Beg.Bal.	0													
172															
173	Cash Balance		12130	12130	12329	12425	12839	12568	12223	12928	12894	12767	12871	12323	12323
174															
175	(Min.Bal in 000s	12	All borrowings and repayments in round 1000 amounts)												

All the labor expenses are cash. This includes direct labor, indirect labor, sales salaries, G&A salaries, commissions, and payroll taxes. Direct material purchases are payable in 30 days so the cash payments are lagged behind the purchases by one month. The January cash disbursements due to direct material purchases is the $24,000 accounts payable on the initial balance sheet. In each later month, the cash out is the prior month's purchases. The purchases for December yield the accounts payable on the ending balance sheet.

The cash payments on the General and Administrative Costs of $4,500 are assumed to be apportioned throughout the year according to the working days per month. The Investment Payments on row 156 of Table #19 are pulled over directly from row 161 of Table #11, the Schedule of Investment Payments. The long-term debt amortization payments are equal each month. The interest portion of $279 is given in row 157 and the principal portion of $833 is given on row 158. The total Miscellaneous costs of $2,000 are split according to the working days in each month.

The Cash-Out is totaled in row 161 of the Cash Budget. The Net Cash Flow is the Cash-In (Sales Receipts) minus the Cash-Out. The Beginning Cash balance of $12,000 is obtained from the initial balance sheet. The stock/flow equation applied to cash yields

Cash B4 Finance = Beginning Cash + Net Cash Flow.

The remainder of the Cash Budget is concerned with managing the line of credit to maintain the minimum cash balance of $12,000. All borrowings and repayments are in round thousand dollar amounts. The interest is at the annual rate of 15%. It is calculated and paid on a monthly basis at the monthly rate of 15/12 = 5/4 = 1.25% (row 168). The line of credit is new so there is no initial balance at the beginning of the year.

Heretofore, the actual VisiCalc cell entries used in the spreadsheet model have not been emphasized in our exhibition. The entries have been straightforward raw numbers, cell references, summations, or elementary algebraic formulas. The formula to compute the net borrowing for the line of credit is abit more complicated so it will be described in more detail.

The quantity "Cash B4 Finance minus the Interest" is the relevant amount used to determine the amount of borrowing (negative borrowing is repayment). It is first truncated to thousands. This is done using the @INT function which simply wipes away anything after a decimal point to yield the integer portion of

any decimal number, e.g., @INT(1.13) = 1. To find the number of thousands in a number, divide it by 1,000 and then truncate it to an integer. Hence

@INT((Cash B4 Finance - Interest)/1000)

is the number of thousands available before borrowing.

The Minimum Balance in thousands is given in the cell V175. Thus

Minimum Balance - @INT((Cash B4 Finance - Interest)/1000)

is the shortfall in thousands if positive, and is the excess over the minimum balance if negative. Multiplying times a thousand gives the shortfall or excess in dollars

(Minimum Balance - @INT((Cash B4 Finance - Interest)/1000))*1000.

If this quantity is positive, then it is the net borrowing. If it is negative, it is the excess available for repayment unless it exceeds the balance owed on the line of credit. Hence when it is negative, the repayment is the maximum (least negative) of the negative of the line of credit balance and the excess available for repayment:

@MAX(-LOC Balance,(Min.Bal. - @INT((Cash B4 Finance - Interest)/1000))*1000).

But this formula also works when there is a positive shortfall since the @MAX selects the positive shortfall over the negative -LOC Balance. Hence the above formula is the one to be used after substituting the appropriate cell references for the quantities.

The net borrowing formula in V169 is

@MAX(-U171,(V175-@INT((V165-V168)/1000))*1000).

The next net borrowing formula in W169 is

@MAX(-V170,(V175-@INT((W165-W168)/1000))*1000).

This formula is then replicated down the row from X169 to AG169 with all cell references being relative except the absolute reference to V175.

The Balance Due on the line of credit (row 170) is computed as the prior Balance Due plus the Net Borrowing. The Cash Balance (row 173) is the Cash B4 Finance minus Interest plus the Net Borrowing.

The Initial and Ending Balance Sheets

The Initial Balance Sheet, Table #20, is given data for the plan year. It will be useful to recall the history of the equity accounts. The cooperative uses the ICA model structure adapted to the American context from the Mondragon cooperatives. Each member has an individual capital account and there is a collective account. There is also a contra-equity account for startup losses. The individual capital accounts accrue interest at the annual rate of 6%.

The plan year is the second year of operation for the cooperative so the Initial Balance Sheet is for the end of the first year of operation. At the beginning of operation, the equity in the individual capital accounts was $140,000. The collective account and the startup losses account had no balance.

In the first year of operation as a cooperative, the year before the plan year, there were losses of $33,330. The Net Income is split into equal individual and collective portions. The collective portion is added to the collective account so its balance on the Initial Balance Sheet is

$$-33,330/2 = -16,665.$$

Until the company makes its first profit, the individual portion of the negative Net Income is given the special startup loss treatment. One-fifth of the individual portion is assigned to the individual capital accounts while the remaining four-fifths is assigned to the startup losses account. One quarter of that entry in the startup losses accounts "seeps out" into the individual capital accounts in each of the next four years. Thus the initial startup losses are spread over a five year period.

The one-fifth assigned to the individual accounts is

$$-16,665/5 = -3,333.$$

The remaining four-fifths in the startup losses account is

$$-16,665 - (-3,333) = -13,332.$$

The interest on the individual capital accounts is

$$\$140,000 \times .06 = \$8,400$$

so the balance for the individual capital accounts on the Initial Balance Sheet is

$140,000 + 8,400 - 3,333 = $145,067.

	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
177	TABLE #20:	INIT.												TABLE #21:	ENDING
178	BALANCE	SHEET												BALANCE SHEET	
179	ASSETS:													ASSETS:	
180	Cash	12000												Cash	12323
181	A/R	49000												A/R	80241
182	Inventories:													Inventories	
183	Prod. A	4000												Prod. A	12266
184	Prod. B	10000												Prod. B	136872
185	Raw Mat.	2100												Raw Mat.	2404
186	A Parts	750												A Parts	812
187	B Parts	120												B Parts	347
188	Pack.	500												Pack.	379
189	Current	------												Current	------
190	Assets	78470												Assets	245644
191															
192	Equip.	35750												Equip.	60500
193	Bldgs.	80000												Bldgs.	80000
194	-A.Depr.	-15150												-A.Depr.	-32794
195	Net Fixed	------												Net Fixed	------
196	Assets	100600												Assets	107706
197	Total	------												Total	------
198	Assets	179070												Assets	353350
199		======													======
200	LIAB. & EQUITY													LIAB. & EQUITY	
201	A/P	24000												A/P	26281
202	Cur.Debt	10000												Cur.Debt	43800
203	LTD	30000												LTD	28625
204															
205	Ind.Acct	145067												Ind.Acct	211521
206	Col.Acct	-16665												Col.Acct	53122
207	-StUp Ls	-13332												-StUp Ls	-9999
208	Total Liab. &													Total Liab. &	
209	Equity	179070												Equity	353350
210		======													======

Table #21 gives the projected Ending Balance Sheet for the plan year. The balance in Cash is taken down from Table #19, the Cash Budget. The balance for Accounts Receivable is taken from Table #18, the Cash Collections Schedule. The ending inventory for products A and B is drawn from Table #4. Tables #5 and #6 give the inventories for raw materials and purchased parts in physical terms. The ending levels of these inventories are multiplied by the unit prices to obtain the entries on the Ending Balance Sheet. The packaging inventory, Table #7, is already given in monetary units so the ending level can be directly used on the Ending Balance Sheet. The Current Assets are the sum of Cash, A/R, and the Inventories.

The new purchases for equipment during the year are $15,750 for the two B machines and $9,000 for the pickup truck. Adding to the Equipment amount from the Initial Balance Sheet yields the ending Equipment balance. There were no new purchases of buildings during the plan year. Adding the Manufacturing Depreciation and General Overhead Depreciation from the Operating Budget to the initial Accumulated Depreciation yields the ending balance in that account. The sum of the Current Assets and the Net Fixed Assets yields the Total Assets.

The ending balance in A/P is the December balance for direct materials purchases. The ending Current Debt has three sources:

$10,000 = current portion of LTD
7,800 = next year's PMTs on the machines and truck
26,000 = ending line of credit balance

$43,800 = ending Current Debt

The ending LTD is the sum of the remaining long-term portion of $20,000 on the old LTD plus the machine and truck payments in the second and third year (Table #11).

The Net Income for the plan year is projected at $139,574 so the individual and collective parts are

$139,574/2 = $69,787.

Adding the collective portion to the previous balance in the collective accounts yields its ending balance. Corporate income taxes have not been estimated in this planning exercise. If the tax is estimated, it is subtracted from the Collective Account and then either added as a liability Taxes Payable or, if paid, subtracted from Cash on the Ending Balance Sheet.

Another $3,333 seeps out of the startup losses account and there is no addition to the account so its new balance is $13,332 - 3,333 = $9,999.

The interest on the individual capital accounts is

.06 x $145,067 = $8,704.

The interest comes out of the individual portion of the Net Income so the remainder

$69,787 - 8,704 = $61,083

is the positive patronage allocation to the individual accounts. Hence the new balance in the individual capital accounts is

$145,067 = old balance individual capital accounts
69,787 = individual portion of Net Income
-3,333 = seepage from startup losses account

$211,521 = new balance individual capital accounts

Adding the liability and equity accounts yields the Total Liability and Equity which balances with the Total Assets on the Ending Balance Sheet.

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