Introduction

Investment and return

Product Design and Development is not an optional general overhead expense but an investment which can yield some of the highest rates of return.

Financial policies which treat design as an expense rather than an investment with a measurable return have discouraged some very profitable design projects. Research by the Open University has shown that out of a typical sample of 3,000 SMEs nearly half reported a 100 per cent return on investment in design in the first year following product launch.

Strategy and planning

The planning of R&D activity and spending must be an integral part of overall business strategy and planning.

Increased and maintained profit

Investment in design should be planned and justified not only in terms of the incremental profits it can generate, but also in terms of the historical profits it can help to maintain. This is because margins can fall rapidly as products age and demand for them decreases.

The foundation for future expenditure

If added value is designed into a product, the higher profit margins will support continued spending on design and efficient production.

Identifying and justifying design spending

Design costs should be defined and calculated in a way which clearly reveals the benefits of such expenditure, as well as how it performs as an investment. Accountants should become actively involved in defining and justifying design expenditure. To reflect this, the terms 'cost accountant' and 'cost accounting' should be replaced by 'profitability accountant' and 'product profitability analysis'.

Product profitability

Distinguishing design spending from other spending and justifying the level of expenditure demand careful analysis and calculation of product profitability. There are different approaches to the estimate of 'product profit' and 'product cost', so it is crucial to establish a consistent and suitable one for your business with your accountant.

Gross profit margins

Some accounting systems are based on achieving a gross margin after deducting all variable costs, but this implies that fixed costs exist — and no costs are fixed forever. One of two main approaches can be used, depending on the scale of the project. Usually, it is best to define the gross margin level as the level achieved after charging all costs, such as direct materials, direct labour and certain others, which are dedicated (can be specifically allocated) to a particular project or product. This certainly applies to incremental product improvements. However, if you are considering a major, long-term, stand-alone project, such as a completely new product, it is important to calculate the full costs very carefully and include all shared costs and fixed overheads in your calculations.

Added value

Added value is a simple but useful performance monitor and should always form part of product profitability analysis. In this context added value is best regarded as the difference between sales value and the cost of all bought-in goods and services which can be directly related to the product.

Net product profit

Business plans, annual budgets and monthly management accounts need to show which products provide the most profit and to track products' profit history. Estimates of net profit attributable to specific products or groups of products will therefore be required. All non-dedicated costs or all non-variable costs (depending on which of the two main approaches have been used to calculate gross profit) will have to be apportioned.

Capitalisation and amortisation

Capitalisation and amortisation must be handled correctly if a product profitability calculation which properly reflects return on design investment is to be reached. Where product development costs are substantial, it is inappropriate to recover design and development overheads alongside manufacturing overheads as a percentage on top of manufacturing direct labour or as part of a manufacturing hourly rate. It is better to capitalise product development costs against projects first and then amortise them against the sale of relevant products. This means agreeing a clear basis for amortisation with Marketing. It is also better to underestimate the quantity of sales over which to amortise, and to achieve higher unit amortisation on early sales while the product can still command a premium price.

Some projects may well under-amortise, so you will need to over-amortise on others. Some companies account for the whole of their design and development costs in this way; othS only amortise the dedicated or variable cost elements.

Because design is a continuous process, it is usual to write off costs against current earnings in accordance with Statement of Standard Accounting Practice, but this obscures the benefits which should ultimately arise from expenditure on design. The SSAP does provide for capitalisation as well, but few companies have taken advantage of this. Taking expenditure to the profit and loss account in the year it is incurred may be conventionally prudent in statutory financial statements for external purposes. However, there is no reason why internal accounting, reporting and control should not treat design costs as an investment to be amortised over the profitable lives of products, as these lives normally far exceed a single accounting year. In some businesses, similar logic should be applied to market development costs.

Design department costs

Design department costs must also be monitored and apportioned in a way which highlights their benefits. This is an essential part of obtaining the appropriate product profitability calculation. Design department costs can usefully be classified under the following headings:

- payroll costs
- space costs
- equipment costs
- general office expenses.

Payroll costs

People who work on specific projects should be booked to weekly timesheets so that labour costs can be allocated to relevant projects. Staff sometimes regard this as bureaucratic, but control of labour resources is a vital ingredient of project management. Supervisory staff can often complete the time records required, particularly if they are reminded not to exceed the levels of accuracy or detail required for project management purposes.

Only management and staff who spend little of their time working directly on individual projects should be charged to an overhead account. When in doubt, charge 'direct' to projects and clamp down on anyone suggesting that time recording is related to status. It is now thought inappropriate to deal with some payroll costs as fixed and other payroll costs as variable. The objective is to estimate the share of total payroll costs (whether direct or indirect) that should be attributed to a product or project.

The hourly design rate

A common method of apportioning design overheads to individual projects is to add a percentage mark-up to 'direct salaries', but most people find it more helpful to use the hourly or daily rate system. This is more compatible with planning and allows comparison with subcontracting alternatives. Total design department costs should therefore be divided by direct hours (those specifically chargeable to projects) to arrive at an hourly design rate. Keep the system as simple as possible, and use only one hourly rate unless there are very large salary differences or unless very expensive specialist facilities (for example wind-tunnel testing or technical computing) are used in differing proportions.

Variable costs

Variable costs, such as bought-in materials and subcontract work, should be charged directly to relevant projects.

Central service charges

Central service charges should be carefully distinguished and, where necessary, challenged. The design function should accept service charges only where these can be clearly justified and where the costs concerned would be avoidable if the design activity did not exist.

Manufacturing, sales and other overheads

The product profitability calculation can now be completed by taking all other overheads into account, as well as the direct costs of manufacturing. Once appropriate amortisation levies have been deducted to cover product and market development costs, charges will need to be made for overheads (including depreciation) incurred in manufacturing, sales and support. Activity-based costing methods should be used to ensure that charges reflect the actual support provided by each particular function to the product in question. Always remember that it is better to be approximately right than precisely wrong. Ensure that all costs are apportioned and that there is no significant unrecovered balance of overheads, except on capacity under-utilisation (see below).

Fixed manufacturing overheads

The case for investment in product design has often been concealed or threatened by poor apportionment of fixed manufacturing overheads. These can represent a large part of the total costs and yet are often beyond the influence of the designer if the company is not prepared to alter or update its facilities continuously in response to new designs and technologies. Innovative design can eventually help to bring about large fixed overhead reductions.

When the factory is short of work, special care must be taken in apportioning fixed manufacturing overheads (such as depreciation and rent) to products. It is then customary to allocate these as if the factory were working to capacity, and to create a separate loss variance attributable to under-used capacity and not to products. Unfortunately, the definition of 'normal' in this context is arbitrary and subject to competitive pressures. Some companies avoid the problem by charging only variable manufacturing costs against, products to arrive at a gross margin or 'contribution' towards profit and the recovery of fixed overheads. This approach can be dangerous unless accompanied by target recovery rates agreed with your accountant, and by constant review of the actual level of overhead costs to keep them down.

The final calculation

By using the above approach, your accountant will arrive at realistic calculations of product profitability (before interest and tax). This method will help to avoid the common tendency to under-cost (and sometimes consequently under-price) complex, low-volume products. Remember that these 'management profit' calculations have been adjusted to allow for the capitalisation and amortisation of product development (and possibly also market development) project costs. To this extent `management profit' will normally differ from 'financial profit' used for statutory and fiscal purposes.

SUMMARY

When product development costs are significant, make sure they are identified and charged accurately against products. This will usually involve capitalisation against projects, followed by amortisation against sales. Without accurate identification and charging of costs your product profitability analyses will be seriously flawed and you will be unable to evaluate or appreciate the benefit of your design spending.

Business planning and product development

A great deal of skill and general business understanding is required to marry the strategic, operational and financial aspects of business planning successfully.

Product development programmes must be the foundation of your leaders in their field, but in order to survive, you must plan to create successful products. This also means defining what resources you need to meet your targets.

The total business plan

The management team should share the task of preparing the business plan, but you may need independent advice on preparing it. A total business plan should include at least:

- a costed product and marketing plan
- a costed resource plan
- a list of important, clearly defined management actions (rather than unhelpful, general exhortations)
- financial projections and risk assessments for each quantifiable activity It should answer the following questions with as much qualification as possible:
- where are we now?
- where is the competition now?
- where will our competitors (potential and actual) be in, say, three years' time
- where do we want to be then?
- how do we get there?
- When drawing up the business plan:
- take account of the company's track record on implementation and forecasting to ensure realistic costing and timing
- indicate when targets are to be achieved and by whom
- pay special attention to issues crucial to financial survival and growth
- identify objectives that demand important organisational or other changes as well as just routine monitoring
- quantify the financial implications of different scenarios by using 'what if?' (sensitivity) analysis: how will projections change if a launch date slips or if sales of new products are below forecast?

Revisions and lifespan

The financial projection may indicate that cash flow requirements are too demanding, and it may be necessary to revise the business plan, but don't let your financial policies dictate your sustainable growth rate. This is putting the cart before the horse. You should start with the optimum growth plan, which should be sound and profitable, then seek the necessary finance. Allowing good, profitable growth businesses to be constrained by arbitrary financial policy is a cardinal sin, albeit a major UK problem.

The business plan should be a now ‘snapshot’, action-setting document, normally covering at least a three-year period, although the optimum planning period is highly dependent on individual

circumstances. Don't be constrained by undue emphasis on a specific, preordained period: these are an accounting rather than a strategic concept.

Planning falls into categories of diminishing certainty:

budget: highly defined financially, detailed short-term plans, limited flexibility

medium-term outline: approximate timescales, broad financial estimates long-term directions including alternatives.

These periods are not fixed and depend on the level and intensity of competition in the particular industry. Link the business plan with a rolling financial forecast with the first forward period covering what remains of the detailed operating plan and budget.

Business units within groups are often unduly restricted by 'sun and moon worship' (the need to conform to preordained monthly and annual reporting periods). Independent companies can avoid this problem, planning and accounting more in accordance with the natural needs and opportunities of the business. Owners and bankers must still, however, be kept fully in the picture!

Several revisions may be necessary before the business plan meets your growth and profit objectives, cash limitations and so on. It should be structured to be easy to revise, and should be updated not only to provide an annual extension, but also whenever significant changes are required due to unforeseen external events or because earlier forecasts were wrong.

The product and marketing plan

The product and marketing plan is an integral part of your business strategy and is the key to the future health of your business. It should be drawn up in close co-operation between design, marketing, manufacturing and financial functions, and should outline:

- products to be withdrawn or replaced
- new and improved products to be introduced
- product launches and other key dates
- sales and gross profit forecast for each main product and/or market category.

Remember to take into account what key competitors will be doing during the planning period.

Product lifecycle

A successful product and marketing plan depends on properly understanding the anatomy of 'product lifetime', which is the period between product launch and withdrawal from sale. It can be divided into four distinct stages: introduction, growth, maturity and decline. Its duration depends on the type of product and the degree of market competition.

The following factors determine product lifetime and can have a major influence on profit:

Technology: for example, microprocessors foreshortened the life of machines with electromechanical controls

Declining sales: if you wait until sales fall before designing the next model, it may be too late to recapture lost market share

Being first to Market: the company that is first to market can often command premium pricing

Being late: being six months late with a five-year-life product can lose you a third of your total profits.

If income is to be maintained, it is essential to anticipate and plan ahead. It is essential to anticipate and plan ahead Ideally you will want a new and potentially more profitable product to replace an older one before sales of the latter start to decline. How does the average life of your products compare with those of your principal competitors? You should aim to make it shorter rather than longer.

At relatively low risk and for modest expenditure, you may be able to introduce minor innovations that will extend a product's life and generate welcome additional profit (and cash) until a more radical replacement is launched.

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Evaluation

To complete the product and marketing plan: prepare sales and gross profit forecasts for each main product, including volume, market share and unit price data as well as money totals prepare a total business summary of these sales and gross profit forecasts take a view on the likely margin of error in the forecasting in particular, assess the viability of new projects in the product and marketing plan, and the vulnerability of related forecasts.

All projections and models should reflect clearly stated, realistic and mutually consistent assumptions year by year for each product on volume, market share and gross margins. They should also take account of the interrelationships between volume and price assumptions on the sales side, and volume and cost assumptions on the purchasing and production side. The real price of an unchanged product (the price adjusted to eliminate inflation) tends to fall year by year as a result of competitive pressures and increased productivity.

Sufficient thought must be given to these fundamental issues. If forecasting is done well, the need for new-product introduction or existing product development is easier to demonstrate and to understand, and design spending therefore easier to justify.

The resource plan

Resource planning involves estimating each type of resource required in both physical and financial terms:

- staffing (in-house and external)
- training and other incremental overhead costs
- fixed and working capital requirements.
- Staffing
- Companies should plan for:
- adequate management strength
- core skills strength to develop a competitive advantage
- minimum permanent staff that can be fully employed throughout the whole planning period
- use of consultants or subcontractors for the balance.

Competitive advantage depends on continuous development of knowledge specific to the technologies which can be applied to your product. That knowledge base must not only be maintained at all costs but also expanded. This is fundamental to achieving high rates of return on product development expenditure.

Managing projects requires a significant level of in-house knowledge, but there is a level of activity below which it is difficult to justify in-house design skills. Recruiting a design engineer with specialist skills will be a recipe for disaster unless you have competent in-house project management and supervision. If you haven't either, recruit a competent manager or consider subcontracting the entire project and its management.

Product design resource requirements often vary considerably over time. If based only on 'current establishment' staff levels, resources for new projects can become totally inadequate. Where this creates delays, company profits are lost. Better flexibility can be created by transferring staff between departments, which also broadens experience and shows staff how business functions interrelate.

Planning estimates should be built up project by project from a 'zero base' to ensure that product creation resources are linked to marketing and product strategies. In particular the right balance must be struck between in-house staff and subcontract services and consultants. Be careful also to plan the appropriate resources for your production, sales and marketing programme, which are likely to be much more expensive than the design programme.

Incremental overhead costs

It is important to evaluate the incremental effects of new programmes on overhead costs such as training, travel and equipment rentals. Some overheads may be significantly affected by the level of new or increased project activity. In such cases they should be allocated approximately and specifically to projects, rather than left to be apportioned generally and inaccurately as is, unfortunately, traditional.

Capital requirements

It is important to allow for fixed and working capital requirements, which will have an impact on cash flow, interest charges and depreciation. The following will make demands on cash flow:

- capital purchases (buildings, plant and equipment)
- working capital (including new-product inventories, but remember that working capital for older products will phase out with the products themselves).
- On the other hand, the following may contribute to cash flow:
- supplier contributions to design expenditure — made possible by longterm business relationships
- customer contributions to design expenditure
- government grants.

If necessary you should consider new shareholders. This may be possible through a merger or through private investment, taking advantage of the tax incentives provided by the Business Enterprise Scheme. Alternatively, you could consider a partial disposal of a peripheral part of your business to allow you to focus more effectively on the core.

Compilation

After producing a costed resource plan for each product, compile an aggregated total:

aggregate the total year-by-year requirements for each main, non-interchangeable category of labour and equipment

build up by project or function or both

compare with your existing resources and analyse the major changes required.

Review and rework

The resource plan may need reworking several times before it is acceptable. Since no plan is perfect, flexibility must be built in to accommodate changes. This can be achieved by maximising the flexibility of in-house staff and varying the use of subcontract staff. Aim to maximise opportunities for natural wastage and training of staff.

When balancing your resources:

- focus on profit improvement potential and strategic opportunities and threats
- review project start and completion dates but generally aim to advance rather than delay launch dates.

SUMMARY

The business plan should define the present and likely future position of your company and your competitors. The plan should be fully costed, carefully tested and easy to revise. It should cover at least three years, depending on individual circumstances.

The product and marketing plan should aim for profitable growth through the introduction of new and updated products. It should be based on a good understanding of the product's lifetime, and should include sales and gross profit forecasts accompanied by a broad evaluation of risks and potential ranges of error.

The resource plan should aim to maintain the right levels of management strength and in-house skills, but also provide for subcontracting. Possible supplementary sources of capital should be investigated if necessary. Needs should be assessed by project and/or by function, and resources reallocated and modified as appropriate.

Minimising risk

Large amounts of money can be saved if project managers identify risks

and take steps to minimise them. The main risks are:

- technical: failure to meet key performance parameters specified in the design brief
- financial: project cancellation leading to loss of future profit potential; overrun of project costs
- marketing: failure to make a correct assessment of the market and consequent loss of profit and reputation
- timescales: overrun and consequent loss of market.

Get the concept design right and use enough resource to make sure of this. Remember that expenditure on the concept stage represents only about 4 per cent of lifetime product costs, yet the concept design determines approximately 80 per cent of lifetime product costs.

To minimise risk, project managers should also aim to:

involve the Board: the concept stage is largely a paper exercise which the Board all too often ignores, so abdicating their responsibility for the project

avoid technical 'quantum leaps': innovate incrementally and balance new designs with product improvements

practise value engineering from the outset to keep the product cost down and to provide scope for higher added value features

work in parallel: involve Marketing, Manufacturing and Finance from the outset; where applicable practise Simultaneous Engineering

plan in detail but keep the plan flexible.

Project approval

The chief executive, any other directors concerned, and the financial controller should authorise new projects and major revisions, and should specifically:

- approve the appointment of the project manager responsible for achieving project objectives and authorisation and control of resources
- approve the project plan and expenditure budget, and set milestones for review
- decide whether a more detailed feasibility study or more planning is to be carried out before a full go-ahead.

Ask your accountant to establish a method and model geared to your own particular business and accounting system, then stay with it. Make sure the method:

- is logical in relation to inflation, discounting and interest rate assumptions, since these factors strongly interrelate
- is clear and consistent with regard to depreciation, interest and taxation
- produces a sensible answer which can be easily and correctly interpreted.

Most evaluations omit a crucial point: the project should not only be viewed as a stand-alone option; allowance should also be made for the financial penalties of doing nothing. Ideally, therefore, the arithmetic should reflect the incremental differences compared with taking no action, for if product development investment is delayed too long, the whole business and the jobs of its employees will be threatened. If production investment is similarly delayed, the factory will eventually have to be closed and all production subcontracted.

All financial aspects of a project must be taken into account in financial evaluation. Many project evaluations focus incorrectly on either product design expenditure or the cost of new factory equipment — or even a new marketing initiative. The required combination of all these elements, not to mention any incremental working capital requirements, must always be included.

Techniques of financial evaluation

The most commonly used techniques of financial evaluation are:

- payback period
- average return on investment
- discounted cash flow (DCF), involving net present value (NPV) or internal rate of return (IRR).

One can, however, exist perfectly well without the more sophisticated discounted cashflow, net present value or internal rate of return calculations. These are merely optional refinements. They must not be used to blind with science when the underlying risks and assumptions have been inadequately investigated and understood. Unfortunately, many people forget that the validity of the underlying commercial and technical assumptions is far more important than the particular choice of evaluation arithmetic.

Payback period

Payback period is the time from the start of the project to the point where you have recovered all the money spent to date on it. It is easy to visualise and to calculate but has limitations. This method is widely used as a simple tool to rank proposals for similar types of project. However, to ensure a substantial period of net positive cash flow, the payback period should generally be less than half the expected product lifetime

The weighted average date of the project cash outflow and investment should be used as the start of the payback period. If extra money is being borrowed to finance the project, the interest cost of this money should also be taken into account.

The limitations of the payback period technique are that it:

- is insensitive to cash flow within particular time periods
- ignores the time value of money
- takes no account of cash flows after payback
- requires specific criteria for acceptability to be established for the particular business, either by reference to competition or arbitrarily Return on investment

The general convention on calculating return on investment is before interest and before tax. Inflation and depreciation charges should be taken into account when using this method, but, as with all evaluation methods, conservative assumptions should be used, particularly when only one set of figures is being produced and there is no accompanying risk analysis.

Investment rates of return consist of three elements:

- Estimated future inflation. This is the notional interest required to maintain — after tax — the capital value of a monetary investment in real, purchasing-power terms.
- True non-risk interest. This varies in long-term cycles depending mainly on general investment demand and general savings supply. A good marker is the compound annual return over five years obtainable on National Savings index-linked certificates (4.5 per cent in October 1991).
- The risk premium appropriate to the particular business or project. This is typically in the order of 5 to 10 per cent. An established track record clearly helps to keep this premium down.

When the inflation element is high and when projects have to be financed to a significant degree by borrowed money, it can become very difficult to provide financial justification for long-term projects. Cash flow is drained at a critical time to provide the inflation-compensating element of interest. Logic demands that inflationary price increases should be built into project profit forecasts, albeit at realistic levels allowing for the decline in a product's competitiveness over time. Unfortunately, working capital requirements can be greatly increased as a result of inflation, so this factor must also be taken into account.

Discounted cash flow techniques

The following methods use discounted cash flow (DCF) techniques to weigh the time value of money.

Net present value (NPV) calculates the discounted present value of projected future cash flows year by year over the product lifetime, assuming a cost of capital (per cent of discount rate). Projects are ranked on the basis of highest positive NPV.

Internal rate of return (IRR) calculates the discount rate which will produce a nil NPV and is an objective measure of the rate of return earned. Calculation can easily be carried out by successive approximation using a pocket calculator, but computer programs are also available. Companies sometimes set a target IRR against which proposals can be evaluated.

Although the NPV approach is simple and convenient when ranking alternatives, IRR is more easily interpreted by managers and is more widely used. In both cases, the real problem is establishing the rate of return appropriate to the project concerned, bearing in mind the level of risk. This requires discussion with your professional financial advisers.

Project planning

It is now generally accepted that a project manager or task force leader should be appointed and that strong 'horizontal' communications and responsibilities should be encouraged to achieve interdepartmental co-operation. Relatively few British managers have an adequate understanding of the design process, whilst designers are often unaware of financial objectives. By taking a special interest in the composition and training of multidisciplinary project teams, the managing director can encourage:

- designers to adopt a more informed commercial outlook
- accountants and peers from other disciplines, such as production engineering and marketing, to contribute to project assessments and reviews and speed up progress by starting tasks sooner than they would normally.

The more thorough the project plan, the faster the implementation and the lower the eventual expenditure. This is often understood but rarely practised by smaller companies; as a result they use their resources inefficiently and achieve lower than optimum profitability. Detailed planning, particularly for projects which are current or due to start during the next twelve months, is the best way to ensure that everyone knows what to do, as well as when and why.

Assigning resources and costs

Plan each product's design activities against time, paying particular attention to the near-term activities. Resources and budgeted costs then need to be assigned to each activity and aggregated to produce the project plan. If a design investment is common to a family of products (for example a common casing), then apportion an appropriate percentage of the common design and tooling expenditure to each product when calculating its return on investment. The apportionment should reflect each product's expected requirement.

Project planning techniques

The preparation of project and resource plans can often be managed more effectively using proprietary project management software based on PERT (Programme Evaluation and Review Technique) and related costings. Whether or not use is made of PERT or similar computerised techniques, bar (Gantt) charts are almost essential in order to present project plans so that people can easily see and understand them, and to show what they should do and by when. These charts plot target and actual start and finish dates for each component activity.

Advantages of PERT software are that it:

- helps you to plan activities logically and tidily in more detail than might otherwise be feasible
- automatically aggregates the resources of multiple design projects
- automatically updates totals after any changes to the input
- helps to communicate plans and results effectively.

However, software is not always the answer and some projects are far more easily understood manually. Whichever method you choose, be sure to plan in detail.

Financial targets

The level of product sales will determine the ultimate success or failure of a project. Will the forecast benefits be achieved? Will the costs be too high?

For cost-effective management of the product creation process:

- specify target product costs and design requirements
- set budgets for design and development expenditure
- forecast the expected benefits, such as increased market share and profit
- regularly review targets, budgets and forecast benefits: test against what has been achieved and what is achievable and modify or abandon if necessary.

The product designer(s) needs to know the target product cost and understand all the assumptions made in arriving at it. It is vital that design staff have easy access to all manufacturing and materials cost records relevant to the products they are designing. They may also need training in the interpretation and application of manufacturing cost information.

The Marketing Department should set the target price. This should be an iterative process involving the following stages:

- proposal of net selling price (based on a gross selling price less variable selling costs) and preparation of product specification to achieve a target. market share and volume
- agreement of target gross margin percentage (large enough to cover a reasonable proportion of shared overhead costs and to fund all capital requirements, including an attractive profit return for shareholders)

- derivation of maximum target product cost (but remember that whatever the selling price, the product should be made as inexpensively as possible: don't use a derived product cost and design it up to that cost)
- preparation of design brief
- estimation of likely product cost
- revision of target cost, selling price and design brief (but remember that both the unit cost and the selling price are likely to be volume sensitive).

Typically, this process will be part of the feasibility study, but it may be repeated at critical stages of the project. Marketing, Manufacturing and Finance should be involved throughout. It is useful to analyse your competitors' products and use 'reverse engineering' to estimate their ex-works cost. Strip them down and make detailed lists of all the parts, then analyse the production processes that must have been used and build up the costs, comparing them with the design features.

When setting the target product cost, discount the initial effects of the `learning curve' by budgeting for a substantial loss during the manufacture of early production batches. This should be included as part of the upfront investment. When estimating, take account of:

- manufacturing facilities and processes to be used
- batch sizes and rates of production process costs
- Quality Assurance and testing requirements.

Also allow for any costs to your company for:

- installation
- warranty claims
- product support, such as customer training and `helpline'.
- Keeping product costs down
- Establish a policy for using standard components and materials wherever possible. Use these and common sub-assemblies to:
- increase batch sizes, and therefore reduce costs, of standard components
- reduce stock levels and costs by reducing component variety.

SUMMARY

Successful projects depend on careful evaluation and selection of proposals, which should include understanding the danger of inaction and the implications of risk or changes to completion dates. Companies should develop an evaluation technique and model appropriate for their particular business.

Planning projects carefully and thoroughly will help to speed up implementation and reduce expenditure and risk. Designers and accountants must work together, so that designers can understand commercial objectives and accountants contribute to project assessments and reviews. The target product cost must be carefully calculated with allowances made for the production learning curve, manufacturing processes, batch sizes and additional dedicated costs outside manufacturing.

Project accounting and monitoring

Companies sometimes consider that project expenditure records are not important unless they do contract project work for external clients. This view underrates the importance of managing investment in product creation. Where the accountant does not provide project expenditure reports, it is not unusual for the project manager to perform a weekly analysis of time records and purchases to produce an approximate record of project expenditure.

However, this method is very difficult to reconcile with the management accounts and is not recommended for management accounting purposes. At the end of the accounting period, the accountant should provide up-to-date project expenditure reports so that project managers can revise their forecasts, preferably with the accountant's help. (This requires a clear distinction between the incremental costs controlled by the project manager and apportioned cross charges.)

Rushed reports within a few working days after the close of the accounting period should be avoided. Such reports often waste everyone's time as they sometimes contain seriously inaccurate estimates. It is far better to have one accurate report as soon as practicable after the end of the period. Companies should not be so seriously off-budget that they cannot wait a little longer for figures that should confirm expectations. (Since project managers are responsible for authorising expenditure, actual costs reported should not present any surprises.) If costs are off budget, the mechanism is seriously wrong somewhere.

Costing a design project is similar to contract costing. Each design project should have a unique reference number that is recognisable throughout the accounting system and by all staff involved on the project.

Realistic forecasting requires information for each project on expenditure committed but not yet recognised in the accounts. The management accounting system should therefore include records of purchase and subcontract orders placed and reports on outstanding balances. This requires close collaboration between the accounts department and project offices. The object of the exercise is to review and update the estimated total cost of the completed project continually, so that policy changes can quickly be taken as and when necessary.

Measuring progress

To ensure that the project runs to schedule and achieves its objectives,

project managers, in conjunction with their bosses and financial controllers, must establish an effective progress reporting structure for monitoring and control. This reporting should combine all financial and operational aspects of the project, including:

- sub-divisions, stages, milestones
- clearly defined and understood responsibilities within the team
- reviews: monthly and/or at milestones.

The Product / Project Manager should:

- authorise all resources committed to the project. (Expenditure is committed when purchase orders and manufacturing requisitions are signed.)
- estimate and plan, then regularly review labour, material and other variable costs both committed and already incurred
- use the information on outstanding cost commitments when re-estimating future expenditure and completed project cost.
- Project status reports
- Regular status reports prepared by or for the project manager should include the following:
- current status (where are we now?)
- problems foreseen/action taken/help needed
- variances to date:
- time (+/- weeks)
- project expenditure (£ +/-)
- capital expenditure (£ +/-)
- estimated variances to completion (as above)
- revisions to marketing forecasts (if any).
- Reviewing serious overruns
- Projects which achieve milestone targets are usually the financially successful ones. Late projects usually are not. Time is money, and a serious time overrun invariably signals a similar cost overrun. Its cause is usually inadequate resources in the initial stages of the project. In such circumstances a review team, similar to the project screening team should investigate whether or not to continue the project, by asking:
- have the major problems been resolved?
- will there be an acceptable, marketable product that generates an acceptable gross margin?
- can the revised launch date and profits forecast be accepted?
- is the product strategically important to the company?

If the answers are predominantly 'yes', consider the merits of continuing on the basis of a revised cost, time, revenue and profit projection, as if a new project were about to start. Compare this with the alternative of cancelling the project. Historical (`sunk') costs have no direct relevance in deciding whether or not to continue. If the answers are predominantly `no', the design should either be substantially changed to make it acceptable or the project terminated without rancour or recrimination.

Project evaluation

After product launch, when a sales pattern has been established, a peer review should examine whether objectives have been met and what lessons can be learned for the future from:

- marketing: customer acceptance
- manufacturing: unit cost of production
- project management: planning, communications, control of expenditure and timescale
- actual technical performance compared with brief
- finance: likely return on investment.

Financial monitoring should continue after product launch and the project team structure should be retained to facilitate the development of modifications to product and process in the light of feedback from Production, Marketing and After-Sales Service. This process must be encouraged, because it can be highly cost-effective.

SUMMARY

The management accounting system must provide adequate information at the right time for realistic forecasting and review of projects. Progress must be continuously measured by means of project status reports, and serious time and cost overruns must be investigated. Once a sales pattern has emerged the project should be reviewed and lessons learned for the future. Continuous improvement should be encouraged after product launch.