

Product costing in UK manufacturing organizations

Colin Drury and Mike Tayles

University of Huddersfield and

Loughborough University Business School

ABSTRACT

This paper reports and comments on the findings from a questionnaire survey on the product costing practices used by 260 UK manufacturing companies. The aims of the paper are (1) to provide evidence to ascertain the extent to which recent criticisms of product costing can be judged and (2) to compare and comment upon the theory and practice of product costing. The survey findings indicate that product costs computed to meet inventory valuation requirements are widely used for decision-making and internal profit measurement. The majority of firms, however, used both full costs and variable costs for decision-making and the findings suggest that product cost information is used in a more flexible manner than that depicted by previous studies. The paper reports on the methods used by companies to compute full product costs. Most organizations used questionable overhead allocations that are likely to result in the reporting of distorted product costs. The concluding sections of the paper discuss the possible reasons why observed practices differ from conventional wisdom and suggest areas where further research is required.

INTRODUCTION

In recent years increasing attention has been focused on the theory and practice of product costing. Two factors would appear to account for this situation. The first arises from the emergence of a belief that there is a wide gap between the theory and practice of management accounting (see Scapens, 1991). The second factor relates to the enormous amount of publicity that has been generated by the writings of Kaplan (1984, 1985, 1988a, 1988b, 1990), Johnson and Kaplan (1987) and Cooper (1990). In a series of articles they have criticized current product costing systems. They claim

Address for correspondence

Colin Drury, School of Accountancy, Law and Management, University of Huddersfield, Queensgate, Huddersfield, HD1 3DH, UK.

that:

- 1 product costs that are computed to meet financial accounting inventory valuation requirements are also used for decision-making;
- 2 over-simplistic allocation methods (such as plant-wide overhead rates) are widely used to compute product costs and, as a result, distorted product costs are reported;
- 3 direct labour-based overhead allocation bases are widely used in machine-paced and automated production environments;
- 4 external financial reporting conventions encourage a financial accounting mentality and this has resulted in product costing practices following, and becoming subservient to, financial accounting practices.

The above criticisms and the perceptions of a gap between management accounting theory and practice have been derived mainly from observations from a small number of companies, anecdotal evidence and the impressions gained through informal contacts between academics and practitioners, and not from large-scale surveys of practice. At present there is insufficient published evidence to provide a comprehensive description of current management accounting practice. For example, Anthony (1989) argues that 'Information about management accounting practices is abysmally poor' and that 'Almost all information is anecdotal.' He claims that there is a need for survey information relating to the use of management accounting techniques and criticizes assumptions that are often made in the literature that a particular technique (such as direct labour overhead rates) is used by most companies when no statistical evidence is available relating to how many companies use that technique.

These developments provided the impetus for undertaking a postal questionnaire survey which aimed to gather empirical evidence capable of providing an overview of current management accounting practices in UK manufacturing companies. The survey gathered information on a wide range of management accounting practices including product costing, pricing, budgeting, performance reporting, standard costing, capital investment appraisal, the impact of advanced manufacturing technologies, divisional performance measurement and transfer pricing. For a detailed description of the survey findings see Drury *et al.* (1993).

This paper focuses on the survey findings relating to product costing. In particular, the aims are

- 1 to provide evidence to ascertain the extent to which criticisms of current product costing practices can be judged;
- 2 to compare and comment upon the theory and practice of product costing.

The paper consists of seven sections. The purposes of product costing are discussed in the first section. This is followed by a review of the theory and

practice of product costing. The third section comments briefly on previous product costing studies and the fourth section describes the postal questionnaire survey. The survey findings are presented in the fifth section and this is followed by a discussion of the possible explanations of the observed practices. We conclude with some suggestions for further research.

THE PURPOSES OF PRODUCT COSTING

Management accounting textbooks (e.g. Kaplan and Atkinson, 1989; Horngren and Foster, 1991; Drury, 1992) state that product costs are required for two purposes: first, for financial accounting to allocate the manufacturing costs incurred during a period between cost of goods sold and inventories; second, to provide useful information for managerial decision-making requirements. Brignall *et al.* (1991) point out that knowing the costs of different products can be useful for making judgements about their relative profitability and performance, which may lead to decisions about resource allocation, shifting money away from unrewarding activities to those which offer the greatest benefit, or to moves to improve a product's cost performance.

Surveys of pricing methods (e.g. Mills, 1988, in the UK and Govindarajan and Anthony, 1983, in the USA) have also indicated that product costs play an important role in pricing decisions. These studies suggest that cost-plus pricing is widely used, particularly in thin markets where customized products are produced that do not have readily available market prices. Product costs are also of considerable importance in competitive markets where an established market price exists. Kaplan and Atkinson (1989) state:

Even when a firm is selling an actively traded, standard commodity product so that the firm is basically a 'price-taker' in the market place, it still needs to determine its scale of operation, its production technology, the methods and terms of marketing and distribution, and most importantly whether to be in the market at all. All these decisions will be influenced by the perception of the product's 'cost' and by how much profit it believes it is earning from production and sales of the product.

For cost control, textbooks advocate that costs should be traced to functional responsibility centres rather than to products. Reported product costs can, however, be used as a mechanism to motivate managers to manage and control costs. Target costing has recently been widely publicized whereby target costs and not actual costs form the basis of product decisions. Production management are expected to meet the target costs. If the projected product cost is above the target cost then product designers focus on modifying the design of the product so that it becomes cheaper to produce. Manufacturing engineers also focus on methods of improving production efficiency so that the target cost can be achieved. Target costing

is normally associated with new products but can also be applied to cost reduction exercises for existing products. Thus product costs can play an important role in inducing managers to control and reduce costs.

Kaplan and Atkinson (1989) suggest that the accuracy of product costs should be dependent upon the purpose for which the cost information is required. In order to meet financial accounting requirements it may not be necessary to measure accurately the resources consumed by *individual* products. A well-designed product costing system should analyse accurately the *total* costs incurred during a period between cost of sales and inventories. Approximate but inaccurate *individual* product costs may still provide a reasonable approximation of how much of the total expenses for the period should be attributed to cost of goods sold and inventories.

For decision-making purposes more accurate product costs are needed to distinguish between profitable and unprofitable products and activities. If the cost system does not capture accurately enough the consumption of resources by products, the reported product costs will be distorted, and there is a danger that managers may drop profitable products or continue the production of unprofitable products.

Kaplan (1988b) advocates that, because of the different levels of accuracy that are required, companies should develop two separate product costing systems, one for decision-making and the other for inventory valuation. However, Johnson and Kaplan (1987) assert that rather than investing in two separate systems companies have opted, over the years on a cost versus benefits basis, to invest in a single system to meet stock valuation requirements. This has resulted in a situation where costs that have been computed to value inventories are also being used for decision-making and profitability analysis.

THE THEORY AND PRACTICE OF PRODUCT COSTING

Theory states that decision-relevant incremental/avoidable costs should be used for decision-making. This implies that special studies should be undertaken when the need arises, such as when specific products have been identified that require pricing or abandonment decisions. The decision-relevant approach focuses on whatever planning time horizon the decision-maker considers appropriate for a given situation. Hence both the short-run and long-run consequences can be considered when examining alternative courses of action. To analyse product profitability the long-term perspective assigns to a product all those fixed costs that could be avoided in the longer term if the product were discontinued. Most textbooks, however, tend to adopt a short-term perspective when illustrating decision-relevant costs which means that fixed costs are assumed to remain constant whatever future decisions are taken. Therefore variable costs represent the only incremental costs that are relevant for making short-run decisions.

The limited amount of empirical evidence suggests that practitioners reject this short-term view. Surveys relating to product pricing (e.g. Mills, 1988; and Govindarajan and Anthony, 1983) have indicated that full costs are widely used to set selling prices. The preference for using full costs may be due to practitioners adopting a longer-term strategic view with decisions being made on the basis of the longer-term, rather than the short-term, variability in costs.

Piper and Walley (1991) reject the use of full costs, because they rely on dubious cost allocations. They argue that a long-term decision-relevant incremental/avoidable cost approach should be used for making long-term decisions. Cooper and Kaplan (1991) question the feasibility of generating uniquely relevant costs for each decision because the range of possibilities faced by managers is enormous. They argue that full costs are widely used because decision-relevant costs are only appropriate for undertaking special studies, once specific products have been identified, that require decisions on product introduction, abandonment or pricing. Where an organization produces many products it is not feasible to undertake special studies for each product to ascertain those costs that would be avoided if, for example, a product were discontinued. Kaplan (1990) illustrates a situation where a company has only 100 products. He states:

First how do you think about which product you should even think about making a decision on? There are 100 different products to consider. But think about all the combinations of these products; which two products, three products or groupings of 10 or 20 products should be analysed? . . . there's no way to do an incremental revenue/cost analysis on all relevant combinations.

To cope with the vast number of product combinations Kaplan argues that a product costing system is required that reports average long-run product costs derived from activity-based costing (ABC) systems. The product costs reported do not provide information that can be used directly for decision-making. Instead, they report attention-directing information by highlighting those products that require more detailed special studies.

Johnson and Kaplan (1987) and Cooper (1990) claim that full product costs used for decision-making are derived from product systems that were designed to meet financial accounting requirements. These systems were designed decades ago, when most companies manufactured a narrow range of products and direct labour and material costs were the dominant factory costs. Overhead costs were relatively small and the distortions arising from inappropriate overhead allocations were not significant. Information processing costs were high and it was therefore difficult to justify more sophisticated methods of tracing overheads to products. Today, companies produce a wide range of products and overhead costs are of considerable importance. Simplistic overhead allocations using traditional product costing systems can no longer be justified, particularly when information

processing costs are no longer a barrier to introducing more sophisticated systems. It is against this background that ABC has emerged.

Many of the issues relating to the operation of ABC systems have not yet been resolved. Cooper and Kaplan (1991) state that the product costs reported by ABC systems are not designed to be used directly for decision-making. They provide attention-directing information that pinpoints those products where losses are reported and that therefore require special studies to ascertain their long-term viability. Presumably such studies would seek to report long-term incremental costs and revenues. However, the literature does not indicate the extent to which activity-based reported costs should be used as inputs when undertaking special studies. Activity-based product costs include the cost of joint resources that are shared with other products and therefore the reported product cost times the number of units lost from ceasing production will not be equivalent to the avoidable costs attributable to the *individual* product.

ABC systems report long-run average product costs. They do not measure the consequences of individual decisions. Cooper (1990) argues that ABC evolved to support decisions where the number of products is large and decisions are not independent. He states:

the consequences of decisions taken independently can be quite different from the sum of the effects of *individual* decisions. For example, the decision to drop *one* product will typically not change 'fixed' overhead spending. In contrast dropping fifty products might allow considerable savings to be made. Stated somewhat tritely, the sum of the parts (the decision to drop individual products) is not equal to the sum of the whole (the realisable savings from having dropped 50 products). To help them make effective decisions, managers require cost systems that provide insights into the whole, not just isolated individual parts... a resource consumption orientation captures the drop in demand for 'fixed' overhead when a single product is dropped, even though this drop might not result in an immediate reduction in spending. The acknowledgement of a drop in resource consumption allows managers to understand the potential savings from dropping 50 products. To capture this potential, the ABC orientation recognises the long-term cash flow consequences from decisions, not their short-term impact.

Cooper therefore implies that, for special studies where decisions are not independent, product costs should include the cost of joint resources (excluding facility-sustaining costs). The multiplication of these product costs by the units lost from ceasing production of a particular product should, in theory, provide an approximation of the decline in the *total* cash flows in the long term arising from a product abandonment decision. Conversely, where production decisions are independent, the cost of joint resources should not be included and the analysis should include only those decision-relevant costs attributable to a specific product.

We conclude that the use of average long-run product costs may be consistent with theory where the reported product costs are used as an attention-directing system for pinpointing those products that require

special studies. If the objective of these studies is to estimate the long-run cash flow consequences of introducing or dropping a product then the reporting of average long-run product costs can be viewed as a mechanism for applying the theoretical decision-relevant approach in those situations where a large number of different products are produced. It is therefore important that the product costing system generates a reasonably accurate estimate of the resources consumed by each product. Few studies have been undertaken, however, to ascertain the methods that are used by companies to compute product costs.

PREVIOUS STUDIES

Apart from a survey of Swedish engineering companies by Ask and Ax (1992) previous surveys (e.g. in the USA, Schwarzbach, 1985; Howell *et al.*, 1987; Hendricks, 1988; Emore and Moss, 1991; Cohen and Paquette, 1991; and in the UK, Coates and Longden, 1989; Bright *et al.*, 1992) have focused mainly on the changes in management accounting practices that are taking place as a result of the changing manufacturing environment. Little evidence was found from these studies to indicate that either existing techniques are being adapted or new techniques are being implemented. Most of the studies report that direct labour is the predominant method that is used to allocate overhead costs to the products. Howell *et al.* also reported that 54 per cent of the respondents were dissatisfied with their product costing systems. However, apart from the Swedish study, the surveys provide little insight into how companies compute product costs for decision-making.

RESEARCH METHOD

In 1991 a postal survey was undertaken which aimed to gather empirical evidence capable of providing an overview of current management accounting practices in UK manufacturing companies. Prior to mailing the questionnaire a pilot survey was undertaken. The final version of the questionnaire included eighty-seven questions, of which fourteen related specifically to product costing. A copy of the questionnaire with a summary of the replies is presented in the Appendix.

Sample selection

A sampling frame consisting of 3,290 companies was established by extracting from a CD-ROM company information database all those UK registered companies with a trade description that included substantial manufacturing, producing or processing activities and which also had a five-year average sales turnover exceeding £10 million. The sample design

also recognized that many of the larger UK manufacturing companies operate through a divisional structure in which separate plants or divisions are not separate legal entities for financial reporting purposes but are equivalent to separate business units in terms of operational characteristics. The sample design therefore allowed for the inclusion of different divisions, subsidiaries, plants or sites of the same company, or within the same group of companies, provided that they were engaged in different activities. Since the distinction between a divisional and subsidiary business unit is predominantly a nominal one it is appropriate to base any broad analysis of practice on strategic business units rather than trying to analyse the responses by separate group reporting entities. As the survey subject material was of a specialist nature it was necessary to ensure that those completing it were properly qualified to do so. Information provided from the four major UK professional accountancy bodies (i.e. CIMA, ACCA, ICAEW and ICAS) was used to select the survey sample. This information consisted of a list from each professional body of all those accountants who had been qualified for more than five years and who were employed as management accountants in manufacturing organizations. The survey sample was established by selecting from the list of management accountants only those that were employed within one of the identified companies included in the sample frame.

The final version of the questionnaire was mailed to 866 business units during 1991. From the business units to whom the questionnaires were addressed a total of 303 usable responses was received (a response rate of 35 per cent). When the analysis is conducted on the basis of individual registered companies the mailing to 866 business units covered 683 separate companies. The 303 usable individual responses cover 260 separate companies representing 38 per cent of the companies included in the survey.

Analysis by size, principal activities and cost structures

The questionnaire replies were recorded on a database and the Software Statistical Package for Social Sciences (SPSS) was used to analyse the replies. Table 1 provides an analysis of the annual sales turnover for the 260 registered companies and Table 2 presents details of the principal activities of the 303 individual units included in the survey.

A response bias test was performed with respect to size and industry classification by comparing the sales turnover and industry classifications of the responding organizations with those of the sampled population. The Kolmogorov-Smirnov non-parametric test was used. There was no evidence of any response bias with respect to size or industry.

The responses to each question were analysed by size (using annual sales turnover) and the principal activities of each business unit. The analysis by these two factors is reported in this paper only where statistically significant

Table 1 Annual sales revenues of companies covered by responses

<i>£million</i>	<i>N</i>	<i>%</i>
10-14.9	17	6
15-24.9	26	10
25-49.9	56	22
50-99.9	42	16
100-249.9	44	17
250-499.9	23	9
500-999.9	19	7
1,000 and over	33	13
	260	100

Table 2 Industry classification of business units covered by responses

	<i>N</i>	<i>%</i>
Oil and gas	2	1
Engineering/industrials	82	27
Building	20	6
Chemicals and plastics	80	26
Electrical	45	15
Motor vehicles	17	6
Food	29	9
Tobacco	2	1
Paper and packaging	14	5
Textiles	12	4
	303	100

differences are observed at the 5 per cent level using the Mann-Whitney non-parametric test. The analysis by size is based on a comparison of the following two subgroups.

Large business units

The sales turnover of each unit was in excess of £100 million and the turnover of the company exceeded £300 million. Thus a non-divisionalized company consisting of only one business unit was included in this category only if sales turnover exceeded £300 million. With divisionalized companies a division was included only if divisional sales turnover was greater than £100 million and group sales turnover exceeded £300 million. Only one division per company was included in the subgroup of forty-six business units.

Small business units

The sales turnover of both the unit and the company was less than £30 million.

SURVEY FINDINGS**Costs used for decision-making**

The questionnaire contained two questions relating to the extent to which different costs are used for decision-making. The first (see Question 2.1) was concerned with product mix or make or buy decisions and the second (see Question 2.12) required the respondents to indicate the extent to which different costs are used for computing cost-plus selling prices or comparing product costs with the prevailing market prices. The replies are summarized in Tables 3 and 4. These tables indicate that total manufacturing cost (as used for stock valuation) is widely used for decision-making and it is the larger, rather than the smaller, organizations that tend to use

Table 3 Extent to which different costs are used for product mix and make or buy decisions

	<i>Never</i> (%)	<i>Rarely</i> (%)	<i>Sometimes</i> (%)	<i>Often</i> (%)	<i>Always</i> (%)	<i>N</i>
Variable/incremental manufacturing costs						
Small organizations ^a	17	19	22	21	21	47
Large organizations ^a	11	2	24	37	26	46
All organizations	11	9	28	33	19	292
Total manufacturing cost (as used for stock valuation)						
Small organizations ^a	15	13	21	34	17	47
Large organizations ^a	19	26	22	22	11	46
All organizations	17	15	23	31	14	292
Total variable/incremental cost						
Small organizations ^a	47	19	15	17	2	47
Large organizations ^a	11	15	33	26	15	46
All organizations	23	18	26	25	8	292
Total cost (including fixed non-manufacturing costs)						
Small organizations ^a	38	17	17	19	9	47
Large organizations ^a	15	39	20	22	4	46
All organizations	22	23	24	23	8	292

Note

^aThe responses from the small and large organizations are significantly different using the Mann-Whitney U test at a 5 per cent significance level.

Table 4 Extent to which different product costs are used for pricing decisions

	Never (%)	Rarely (%)	Sometimes (%)	Often (%)	Always (%)	N
Variable/incremental manufacturing cost						
Small organizations ^a	27	9	33	13	18	45
Large organizations ^a	12	12	22	20	34	41
All organizations	21	11	27	18	23	267
Total manufacturing cost (as used for stock valuation)						
Small organizations	24	5	18	20	33	45
Large organizations	24	10	20	22	24	41
All organizations	22	10	16	27	25	267
Total variable/incremental cost						
Small organizations ^a	47	22	13	16	2	45
Large organizations ^a	22	19	24	20	15	41
All organizations	32	18	22	18	10	267
Total cost (including fixed non-manufacturing overheads)						
Small organizations	38	9	6	18	29	45
Large organizations	15	19	15	34	17	41
All organizations	23	19	11	22	25	267

Note

^aThe responses from the small and large organizations are significantly different using the Mann-Whitney U test at a 5 per cent significance level.

variable/incremental costs. The replies to both questions were combined and analysed to ascertain the extent to which different costs were used for *either* make or buy, product mix or pricing decisions. The analysis indicated that:

- 79 per cent 'often'/'always' use total manufacturing cost or total cost;
- 70 per cent 'often'/'always' use variable/incremental manufacturing cost or total variable incremental cost;
- 9 per cent 'never'/'rarely' use full costs (i.e. neither total manufacturing cost nor total cost);
- 10 per cent 'never'/'rarely' use variable/incremental costs (i.e. neither variable/incremental manufacturing cost nor total variable/incremental cost).

The above analysis suggests that most organizations use cost information in a flexible manner and that decisions are not based *solely* on full cost information. For example, only 8 per cent of all the respondents used a full cost approach and 'never'/'rarely' used variable/incremental costs. Nevertheless, full costs are extensively used with only 9 per cent of the respondents stating that they are 'never' or 'rarely' used.

The Ask and Ax (1992) survey of Swedish engineering companies also found that full costs were widely used for decision-making. They reported that 58 per cent of the respondents used full costing, 10 per cent used variable costing and 32 per cent used a combination of both these methods.

A major disadvantage of the questionnaire survey method is that it cannot indicate exactly how cost information is used for decision-making. Some organizations may use reported long-run product costs (i.e. full costs) directly to make decisions whereas others may use the reported costs as an attention-directing mechanism for further special studies. It is unclear from the survey findings which approach is used. However, for both approaches the cost system must capture accurately enough the resources consumed by products because if the reported product costs are too distorted there is a danger that incorrect decisions will be made or that unprofitable products may not be highlighted for special attention. The survey therefore sought to ascertain the methods that are used to compute product costs.

Plant-wide overhead rates

The simplest product costing system uses a single global plant-wide rate to allocate overheads to products. Product costs derived from plant-wide rates may be acceptable for stock valuation purposes but it is unlikely that they will be sufficiently accurate for decision-making. A plant-wide rate was used by 26 per cent of all respondents (see Question 2.2). Further analysis indicated that 25 per cent of those respondents that 'often'/'always' used full costs for decision-making produced more than one product and also used a plant-wide rate. There were no significant differences between the replies of the larger and smaller companies ($\alpha = 0.05$). Similar findings were also reported by Howell *et al.* in respect of US companies with 33 per cent of the surveyed firms using a single plant-wide rate. However, the study did not examine whether the resulting product costs were subsequently used for decision-making.

Use of direct labour overhead recovery rates

Commentators have been critical of the continued use of direct labour-based allocation methods, particularly in a machine-paced environment. As direct labour costs averaged only 12 per cent of the total costs for the firms surveyed, it is questionable whether labour-based methods can continue to represent a reasonable basis for allocating overheads to products, especially in automated environments. However, our findings (see Question 2.4) indicate that direct labour hours/cost is still the most frequently used allocation base, being used in 73 per cent of non-automated and 68 per cent of automated production activities. The replies were analysed by sales turnover, direct labour as a percentage of total cost and the purposes for which the

product costs were used (stock valuation and decision-making) but no significant differences in the usage of direct labour-based overhead recovery methods were observed.

Similar findings were also reported by two recent US studies (Cohen and Paquette, 1991; Emore and Ness, 1991) with 74 per cent and 62 per cent respectively of the companies using direct labour methods and 23 per cent and 12 per cent using machine hours.

Treatment of service/support department costs

Textbooks advocate that service/support department costs such as material handling, maintenance and inspection should be allocated to production cost centres based on their consumption of support department resources. The support department costs are thus merged with the overheads of each production cost centre and usually allocated to products on the same basis as other cost centre overheads (normally direct labour or machine hours). Inaccurate product costs will be reported if service department costs are unrelated to direct labour or machine hours. A more accurate approach is to establish a *separate* support department overhead rate based on the factor that causes the costs of the support department to be incurred. For example, articles by Drury (1989) and Shank and Govindarajan (1988) have advocated that traditional volume-based product costing systems should allocate material-related support expenses directly to products on the basis of direct material overhead recovery rates rather than being merged with the overheads of each production cost centre. Question 2.5 focused on the treatment of support department overheads. The following methods were used:

- support department overhead costs allocated to production department and charged to products by means of departmental overhead rates (45 per cent);
- separate support department overhead rates established (21 per cent);
- overheads allocated to products by means of a single plant-wide rate (27 per cent).

A further 7 per cent stated that other methods were used. The analysis by sales turnover revealed that 34 per cent of the larger business units and 13 per cent of the smaller units established separate support department overhead rates (significant at $\alpha = 0.01$). There was no evidence to indicate that those organizations which established separate support department rates were more likely to use full product costs for decision-making.

Volume measures used to compute unit costs

Organizations that use full costs must decide on the denominator volume that is divided into the cost of those resources that are fixed in the short run to obtain the cost driver rate per unit of using resources. Because the cost of supplying some resources is fixed in the short run and the quantity of resources used in each period fluctuates, the choice of a denominator level can have a profound impact on product costs. In view of its importance it is surprising that the choice of appropriate denominator levels has not received more attention by academics. This topic has been virtually ignored in the academic literature since the 1960s (see Purdy, 1966; Horngren, 1967) although Cooper and Kaplan (1992) have recently discussed alternative denominator volume measures for activities to determine ABC unit costs and predict future spending on the supply of activity resources.

Question 2.6 asked the respondents to indicate the activity level that was used for calculating overhead absorption rates. The majority of respondents (66 per cent) used annual budgeted volume as the capacity measure to compute fixed manufacturing overhead rates. The compatibility of this volume measure with the annual budgetary system increases the probability that production overheads incurred each year are assigned to that year's products. However, if budgeted demand falls, overhead rates based on budgeted volume will cause reported full product costs to increase and could prompt a decision to increase prices or discontinue production when a price reduction aimed at increasing volume might be more appropriate. Thus companies that use annual budgeted volume to cost products run the risk of triggering off what Cooper and Kaplan (1991) describe as a 'death spiral'.

Textbooks usually advocate using normal volume as the capacity measure on the grounds that it provides a better approximation of the long-run average costs of providing a firm's operating capacity, since seasonal and cyclical variations and trend factors are cancelled out. Only 11 per cent of the respondents used this approach whilst maximum practical capacity, which risks understating product costs if not consistently achieved, was used by only 6 per cent. Cooper and Kaplan (1992), however, argue that the denominator volume must always be the practical capacity of the activity being supplied, rather than anticipated volume, on the grounds that this represents the unit cost of the capacity acquired to perform the activity. Actual activity levels were used to ascertain overhead rates at the end of the period by 14 per cent of the respondents. This method is rejected in textbooks on the grounds that it leads to fluctuating overhead rates from period to period if seasonal variations in activity occur.

Treatment of non-manufacturing costs

The treatment of non-manufacturing costs has been virtually ignored in the literature, presumably because external financial accounting regulations state that they should not be allocated to products and also because it is generally assumed that, in the short term, they do not represent decision-relevant costs. Question 2.13 sought to ascertain the methods that organizations use to trace non-manufacturing costs to products. A significant number of respondents (23 per cent) never allocate non-manufacturing costs to products for pricing, presumably relying on an increased mark-up to cover non-manufacturing costs. Arbitrary allocation methods were widely used based on either total manufacturing cost (31 per cent), total selling price (13 per cent) or direct labour-based methods (25 per cent). A further 8 per cent stated that other methods were used such as ABC cost drivers and units of output. The replies were analysed by size, the extent to which cost-plus pricing was used and the proportion of non-manufacturing overheads incurred but no evidence was found to indicate that these variables had any significant influence on the methods used to trace non-manufacturing overheads to products.

Activity-based costing systems

Question 2.7 asked the respondents to indicate which of a series of statements relating to the actual and planned use of ABC was most applicable to their organization. Approximately 13 per cent of the organizations have implemented, or are in the process of implementing, ABC. Similar findings were reported by Innes and Mitchell (1991) on the extent of the use of ABC by CIMA members in the UK. In contrast a study by Bright *et al.* (1992) reported that 32 per cent of the firms surveyed used ABC. However, the authors were sceptical of the high reported usage rate and believed that the level of actual usage was much lower.

A number of factors (e.g. number of products sold, level of competition, extent to which full costs were used, overheads as a percentage of total costs) that might favour the introduction of ABC were examined. Other than size, there was no evidence to indicate that any of the potential explanatory factors influenced the planned or actual use of ABC. Of the eleven organizations that had implemented ABC, six used less than ten cost drivers, three used between eleven and twenty and the remaining two used over twenty cost drivers.

Profit measurement and inventory valuation

For external financial reporting UK companies must value stocks at full production cost whereas most textbooks advocate that for internal

reporting stocks should be valued at variable manufacturing cost if profits are measured at frequent intervals. The major justification for using variable costing is that, if cost structures and selling prices remain constant, profit will be a function of sales volume, whereas, with absorption costing, profit is a function of both sales and production volume. Thus it is possible, with an absorption costing system, for profit to decline when sales volume increases and selling prices and costs remain unchanged.

The replies to Questions 2.9 and 2.10 indicate that 97 per cent of respondents prepare monthly profit statements with 84 per cent valuing stocks on an absorption costing basis. Management accountants must therefore devote considerable resources each month to tracking costs so that monthly costs can be allocated between cost of sales and inventories. There is a danger that this may distract them from the provision of management information for strategic planning and decision-making.

The routine demands of monthly profit reporting creates the need for a data processing system to track costs between inventories and cost of sales in a resource-efficient manner. This may account for the use of simplistic product costing systems and widespread use of standard costing systems that we observed in this survey (76 per cent of the responding organizations operated a standard costing system).

Only 13 per cent used the variable costing systems even though 42 per cent of respondents indicated that significant monthly closing stock fluctuations do occur. These findings suggest that most companies prefer their internal profit reports to be consistent with the criteria applied to external reporting and this may perhaps provide a practical rationale for the widespread use of absorption costing systems.

COMMENTS ON THE OBSERVED PRACTICES

The survey findings provide strong evidence to suggest that, for many organizations, the criticisms of product costing practices outlined at the start of this paper are justifiable. The majority of the responding organizations (60 per cent) specifically indicated that they 'often'/'always' used total manufacturing cost (as used for inventory valuation) for decision-making. We found little evidence to suggest that inventory valuation costs were adjusted for decision-making. For example, 90 per cent of the respondents indicated that they used historic cost depreciation, rather than replacement cost, to compute product costs for pricing decisions. The replies suggest that, where total costs are used, product costs are computed by merely adding non-manufacturing costs (using simplistic arbitrary allocation methods) to the costs that are required for inventory valuation requirements.

Direct labour-based methods were the most widely used overhead allocation bases in both automated and non-automated production

environments and plant-wide rates were used to compute product costs for decision-making by 25 per cent of the organizations. The fact that 84 per cent of the responding organizations used absorption costing for monthly internal profit measurement and that inventory valuation costs are widely used for decision-making suggests that the same rules and procedures that are used for external financial reporting are also used for internal product costing purposes.

The second objective of this paper was to compare the theory and practice of product costing. The extensive use of full costs conflicts with theory but the majority of organizations used both full and variable costs for decision-making. Examination of the replies gave the general impression that cost information is used in a more flexible manner than that depicted by previous studies and both the short-term and longer-term consequences of decisions are considered. Most organizations, however, used questionable overhead allocation methods that are likely to result in the reporting of distorted full product costs.

The fact that information prepared for management accounting is not inherently different from the information produced for external financial reporting does not by itself indicate that product costing practices are subservient to financial accounting. The cost-benefit relationship should be considered. Both Scapens (1991) and Horngren (1986) have suggested that the use of simple techniques can be justified on cost-benefit criteria. Horngren states that:

Many companies do not find an investment in a detailed cost accounting system worthwhile. The cost-benefit theme is the foundation for judging whether cost accounting systems should be reviewed. There is a cost of keeping the costs. Many managers perceive, rightly or wrongly, that costs of more elaborate systems exceed prospective benefits.

Rather than investing in two separate systems, one for inventory valuation and the other for decision-making, companies may have opted on a cost versus benefits basis to invest in a single system designed to meet stock valuation requirements.

Approximately 80 per cent of the organizations surveyed indicated that they produced a wide range of different products and virtually all of the companies prepared internal profit statements at monthly intervals. On a cost versus benefits basis it is unlikely that a sophisticated product costing system can be justified that continuously traces the costs to many different products, as they progress through the production cycle, so that work-in-progress and finished goods inventories can be valued at monthly intervals. Instead, a simplistic product costing system is required for meeting internal monthly and annual external profit reporting requirements.

For decision-making the continuous tracking of costs is unnecessary and product costs are required only at infrequent intervals. A periodic cost audit

should be undertaken that more accurately measures the resources consumed by products. Thus a separate, more sophisticated product costing system is required for internal management decisions but we found little evidence to suggest that companies have developed separate product costing systems for decision-making and inventory valuation.

A further reason for adopting financial accounting rules to generate management accounting information is that companies prefer their internal monthly profit reporting systems to be consistent with external financial reporting requirements so that they will be congruent with 'outsiders' measures of overall company performance. Further case study research is required (see Hopper *et al.*, 1992) to ascertain *why* companies adopt financial accounting requirements to generate management accounting information. This research should ascertain whether companies make a conscious choice based on rational reasons when applying financial accounting requirements to management accounting or whether management accounting information is merely a by-product of external financial accounting systems.

We have suggested earlier in this paper that the widespread use of some form of full costs may not be inconsistent with theory if full costs are used for providing attention-directing information for highlighting those products where special studies are required. Where product decisions are not independent the multiplication of product costs, that include the cost of joint resources (excluding facility-sustaining costs), by the units lost from ceasing production (or additional units from introducing a new product) may provide an approximation of the change in the long term of *total* company cash flows arising from the decisions. The rationale for this is that the change in resource consumption will ultimately be followed by a change in spending because organizations make product introduction or abandonment decisions for many products rather than just a single product. Thus where an organization produces a large range of different products (and this situation applied to most of the organizations in this survey) decisions should be based on a combination of product decisions rather than focusing in isolation on a single decision. To capture the complexity of such decisions organizations make decisions using product costs that include the cost of joint resources. A considerable amount of publicity has been given to the inadequacies of allocating overheads on the basis of direct labour when direct labour has become an insignificant proportion of total product costs. Nevertheless, this and other recent US studies, report that direct labour continues to be the most widely used method of allocating overheads to products.

It is possible that the various surveys may have overstated the extent to which direct labour overhead allocation bases are used. Most organizations are likely to have some cost pools where direct labour hours/cost is the most appropriate cost driver. Therefore it is not surprising to find that many

organizations report that they use direct labour to allocate overheads to products. This survey, however, indicated that direct labour was the most frequently used allocation base, often being used for many different cost centres within the same organization. The widespread use of direct labour-based allocation methods might be explained on a cost versus benefits basis. Details of direct labour hours are readily available whereas details relating to more appropriate cost drivers may require expensive data collection costs. Furthermore, there is also some evidence to suggest that direct labour-based allocation methods may not significantly distort information generated for managerial decision-making. Using data obtained from thirty-seven plants of a single manufacturing firm, Foster and Gupta (1990) found that most volume-related measures of output (including direct labour) were highly correlated with manufacturing overhead.

Direct labour-based overhead recovery methods are also reported to be widely used by Japanese companies even though labour costs tend to be a small proportion of total costs. According to Hiromoto (1988) Japanese companies seek to encourage the greater use of technology because this frequently improves long-term competitiveness by increasing quality, speed and flexibility. Hence Japanese managers allocate overhead costs using direct labour cost/hours to focus design engineers' attention on identifying opportunities to reduce the products' labour content.

In the UK and USA accountants and managers have been educated to use traditional volume-based product costing systems that use either machine hours or direct labour hours as an allocation base. Because machine capacity is 'fixed' in the short term whereas direct labour is 'less fixed' cost system designers may have chosen to use direct labour hours because they prefer managers to focus on direct labour hours. We can only speculate, however, on the continued use of direct labour methods and further research is required to explain the widespread use observed in this survey.

The use of plant-wide overhead rates and the failure to establish separate support department rates cannot be explained on the basis that the costs of designing more elaborate systems exceed the benefits. With today's information technology the additional operating costs arising from establishing separate production and support centre overhead rates is likely to be minimal. The only rational explanation we can offer is that some organizations believe that the reported costs are not significantly different from the costs that would be reported with more elaborate systems. The costs versus benefits argument also cannot explain why the majority of companies continue to use annual budgeted volume as the denominator level to compute product costs. Given that full product costs are intended to provide an approximation of average long-run costs it is inappropriate to use a short-term volume measure such as annual budgeted volume. In times of recession the use of annual budgeted volume is likely to overstate product costs and lead to incorrect decisions. A possible explanation for the widespread

use of budgeted volume is that it is not significantly different from average long-run volume. A more plausible explanation, however, is that organizations prefer to charge each year's overhead to products produced during that year and also because more realistic forecasts can be obtained for a single year. Prior to the emergence of ABC, textbooks and management accounting education have given little attention to the computation of average long-run product costs for decision-making. Instead, the management accounting literature has focused entirely on the generation of decision-relevant costs based on over-simplistic situations. Indeed, some of the major textbooks that are widely used in European education institutions do not even cover the computation of average long-run product costs (e.g. Kaplan and Atkinson, 1989; Arnold and Hope, 1990) and those that do (e.g. Drury, 1988) point out that such costs should not be used for decision-making. Until recently, therefore, many practitioners have not been given any theoretical guidance by academics on the computation of average long-run product costs for decision-making. This may partially explain the apparent widespread use of simplistic product costing techniques reported in this paper.

In this section we have discussed possible reasons for companies continuing to use simplistic techniques that are likely to result in the reporting of distorted product costs for decision-making but we have not sought to explain the observed variations in practice. Theory suggests that sophistication in the design of a product costing system should be influenced by the following factors:

- 1 information processing costs;
- 2 the degree of competition faced;
- 3 the diversity of products manufactured;
- 4 the number of products produced;
- 5 the proportion of overhead costs that cannot be directly assigned to products.

Decreases in information processing costs favour more sophisticated cost systems because, for the same processing costs, product costs can be measured more accurately. Organizations operating in a more competitive environment have a greater need for sophisticated cost systems that report more accurate product costs because competitors are more likely to take advantage of any errors arising from managers having to rely on distorted product costs to make decisions. Increased product diversity arising from products consuming resources in different proportions also favours more sophisticated systems because, as diversity increases, so does the level of distortion reported by traditional systems that rely on simplistic volume-related overhead allocation bases. Where an organization markets only a small number of products, problems are unlikely to arise in determining which product combinations should be selected for special studies for

product profitability analysis purposes. Finally, as the proportion of overheads increases so does the level of distortion arising from relying on simplistic overhead allocation bases and the less relevant are direct costing systems that report only those costs that can be directly assigned to products.

The factors influencing the preferred costing system are different for every firm. Firms operating in a highly competitive environment with a high proportion of overhead costs, low measurement costs, high product diversity and which also manufacture a large number of products should design cost systems that report relatively accurate product costs. Where these factors apply, there are stronger grounds for implementing ABC systems and creating many different cost centres with separate overhead rates. In contrast, firms operating in an environment where the cost of measurement is high, competition and product diversity is low, and overhead costs are relatively small might be better served by less sophisticated systems that do not measure product costs quite so accurately.

Direct costs averaged 62 per cent of total costs for those business units that provided details of their cost structure. Similar results were observed by Kerremans *et al.* (1991) from a survey of manufacturing companies located in Belgium. They reported that direct costs averaged 69 per cent of total costs. Traditional stock valuation product costing systems accurately measure the direct costs consumed by products and it is possible that such systems may report reasonably accurate product costs for those organizations that have a large proportion of direct costs. We conclude that the choice of appropriate costing techniques should be seen as situation specific.

CONCLUDING COMMENTS

The survey findings reported in this paper have indicated that many organizations use simplistic product costing techniques that are likely to result in the reporting of distorted product costs. We have offered some tentative explanations for the use of simplistic techniques but it is extremely difficult to ascertain from a postal questionnaire survey *why* some techniques are or are not used. Further field study research is required that adopts a case study approach (see Scapens, 1990) to explain *why* simplistic techniques are used. Theory suggests that the choice of appropriate product costing techniques should be situation specific. Given the diversity of the observed practice future research should identify potential explanatory variables and seek to explain the extent to which they influence the design of product costing systems.

Kaplan and Atkinson point out that separate financial and management accounting systems are used in companies located in German-speaking countries (Germany, Austria and eastern Switzerland). Similar studies to

this one, into the product costing practices in these and other European countries, that ascertain the extent to which more sophisticated product costing techniques are used would be of particular interest. In particular, research is required that compares the product costing practices of those companies that use separate management and financial accounting systems with those that use just a single system.

This paper has focused on the extent to which different product costing techniques are used. Future research is required that explains how product costing information is used for product introduction, abandonment, mix and pricing decisions. In-depth case studies are required, particularly in those companies that produce hundreds of different products, that describe whether or not reported product costs are used initially as an attention-directing device or if they are used directly for decision-making. Where decisions are made on the basis of special studies the nature and content of the special studies should be described. In particular, little is known about whether product decisions are treated as being independent or interdependent and whether or not routinely reported product costs are adjusted for special studies. The ability of activity-based product costs to signal future cash flow implications of product decisions also requires further research. Given that full product costs are used by most organizations for decision-making, it is surprising that, prior to the emergence of ABC, the computation of average long-run product costs has been virtually ignored by academics. According to Johnson and Kaplan (1987) this situation arose because textbooks and academic research concentrated on developing sophisticated models in simplified production settings that bore little resemblance to the problems faced by practitioners. In our view management accounting education and textbooks should place far more emphasis on product cost measurement and the computation of average long-run product costs that take into account complexities encountered by practitioners. In particular, special attention should be given to how reported costs should be adapted when they are used directly for decision-making, or for special studies, and to explaining the assumptions, approximations and imperfections inherent in the product cost calculations.

APPENDIX: PRODUCT COST MEASUREMENT QUESTIONS AND REPLIES

2.1 Please indicate the extent to which the following costs are used for decision-making purposes (e.g. product mix/make or buy decisions):

N = 292			Cost measure used:				
			Never	Rarely	Sometimes	Often	Always
	tick one box per row						
	Variable/incremental manufacturing cost	11%	9%	28%	33%	19%	
	Total manufacturing cost as used for stock valuation	17%	15%	22%	31%	14%	
	Total variable/incremental cost (including non-manufacturing variable costs)	22%	18%	26%	25%	8%	
	Total cost (including fixed non-manufacturing costs)	22%	23%	24%	23%	8%	
	Other (please specify)						3%

2.2 For a typical manufacturing plant* in your company please indicate which method of overhead recovery is normally employed: (*see Guidance Notes for definition) N = 293	A single overhead rate for the plant	26%
	Separate overhead rates for each department within the plant	31%
	Separate overhead rates for each work centre (or groups of work centres) within a department	38%
	Other (please specify)	5%

2.3 How many separate <i>cost centre overhead absorption rates</i> does the typical manufacturing plant* have? (*see Guidance Notes for definition) N = 276	Single rate	No. of cost centre rates:			
		2-5	6-10	11-20	Over 20
	24%	23%	16%	17%	20%

2.4 Please indicate how many separate cost centre overhead rates are used for each of the overhead allocation bases listed below, in automated and non-automated sections of the typical manufacturing plant* (e.g. if a separate direct labour hour rate is computed for five different cost centres please tick the 2-5 box to indicate that five separate direct labour hour rates are used). (*see Guidance Notes for definition)

N = 238	Automated production activities:		Frequency of use:			
	tick one box per row	Not used	1	2-5	6-10	Over 10
	Direct labour hours or cost	32%	14%	26%	12%	15%
	Materials consumed	70%	11%	10%	4%	4%
	Machine hours	51%	6%	19%	9%	14%
	Units of output	58%	11%	15%	8%	8%
	Cost drivers using an activity-based costing system	91%	2%	3%	2%	1%
	Other (please specify)					6%

2.4 (continued)

N = 230 Non-automated production

activities:

tick one box per row

Direct labour hours or cost

Materials consumed

Machine hours

Units of output

Cost drivers using an

activity-based costing system

Frequency of use:

Not used

1

2-5

6-10

Over 10

27%

16%

30%

9%

17%

71%

11%

11%

3%

4%

74%

4%

10%

4%

8%

69%

7%

13%

4%

7%

93%

0%

5%

1%

2%

Other (please specify) 7%

2.5 How are service/support department costs (e.g. the costs of material handling or the costs of the maintenance department) allocated to products?

All service/support department costs are allocated to production departments and then charged to products by means of *departmental overhead rates*

45%

N = 290

The costs of *some* service/support departments are charged to products using a *separate overhead rate* (e.g. a materials handling overhead rate)

21%

Charged to products within a *single plant-wide overhead rate*

27%

Other (please specify) 7%

2.6 Where your organization traces fixed overheads to products, please indicate the basis used to determine the activity level for the purpose of calculating overhead absorption rates

Budgeted annual activity

66%

Maximum practical annual capacity

6%

Estimated average long-run level of activity over a period beyond 1 year

11%

N = 258

Actual level of activity (overhead rates calculated at the end of the period)

14%

Other (please specify) 3%

2.7 Activity-based costing (ABC) has recently been advocated as an alternative approach for tracing overheads to products. Please indicate which of the following statements is most applicable to your organization:

Discussions have not taken place regarding the introduction of ABC

44%

A decision has been taken not to introduce ABC

5%

Some consideration is being given to the introduction of ABC

37%

N = 289

It is intended to introduce ABC

9%

ABC has been introduced

4%

2.8 If you have introduced ABC, please indicate the number of cost drivers currently used to trace overheads to products:

1-3

4-6

7-10

11-20

Over 20

0%

27%

27%

27%

19%

N = 11

2.9 How frequently does your division/company prepare profit statements for <i>internal profit measurement</i> purposes? <i>N</i> = 299	Monthly or more frequently	97%
	Quarterly	2%
	Six-monthly	0.5%
	Annually	0.5%

2.10 If your company prepares <i>internal profit statements</i> , please indicate how WIP and finished goods stock are usually valued for <i>internal profit measurement</i> : <i>N</i> = 292	Variable cost	13%
	Absorption cost (total manufacturing cost)	84%
	Replacement cost (or other departure from historical cost)	3%

2.11 If your organization calculates profits on a monthly or quarterly basis, please indicate whether closing monthly or quarterly stock levels vary significantly from period to period:	Closing stock levels fairly constant	58%
	Significant fluctuations in closing stock levels occur	42%

N = 294

2.12 Please indicate the extent to which the following product costs are used when computing cost-plus selling prices or comparing product costs with the prevailing market price:

		Product cost used:				
<i>N</i> = 267	tick one box per row	Never	Rarely	Sometimes	Often	Always
	Variable manufacturing cost	21%	11%	27%	18%	23%
	Total manufacturing cost as used for stock valuation	22%	10%	16%	27%	25%
	Total variable cost (including non-manufacturing variable costs)	32%	18%	22%	18%	10%
	Total cost (including fixed non-manufacturing costs)	23%	19%	11%	22%	25%
	Other (please specify)					1%

2.13 Where total product costs are computed, please indicate the method which is used to trace non-manufacturing costs to products: <i>N</i> = 249	Allocation as a percentage of total manufacturing cost	31%
	Direct labour hours/cost methods	25%
	Percentage of total selling price	13%
	Non-manufacturing costs are not traced to products	23%
	Other (please specify)	8%

2.14 Where depreciation is included in the product cost, please indicate which basis is used to compute the depreciation costs:	Historical cost	90%
	Current value, replacement cost or other departure from historical cost	10%

N = 266

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