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ACCOUNTING FOR ENVIRONMENTAL COST

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[Y mae fersiwn Cymraeg ar gael oddi wrth yr awdur]

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ABSTRACT

In response to various pressures, businesses have begun to report externally on their environmental policy and performance. The significance of such external reporting depends on the extent of changes in management culture and systems and on how new measures influence management decisions. The 'greening of accountancy' involves a reappraisal of how to identify and measure the relevant costs of processes and products (such as 'Total Cost Assessment') and a redesign of incentive mechanisms. Through these changes managerial decisions and corporate behaviour may be refocussed towards the goal of achieving sustainable development, for example by pursuing a viable industrial ecology.

Evidence to date suggests that organizational inertia, including the relative lack of involvement on the part of accountants themselves, is inhibiting such changes. There is however a paradox that improving environmental performance is often advocated as remedying defects in a company's assessment of their own self-interest.

This new role of accounting is at present embryonic. A number of theoretical and practical issues need research and experiment if its potential is to be realized. There is a need to recognize a new dimension, namely costs which represent environmental benefits (and vice versa). The appropriate balance between the roles of physical and financial performance indicators is not yet established. Moreover the fundamental relationship between accounting and management decision making has always been problematic. The nineteenth-century debates between engineers and accountants illustrate both the subjectivity of the nature of 'cost' and the powerful effects of its construction as part of a new system of accountability. A reorientation of accountability to focus on environmental performance is the major challenge in the "greening" of accountancy.

ACCOUNTING FOR ENVIRONMENTAL COST

INTRODUCTION

'A company's attitude to the environment is likely to be seen as a benchmark of its commitment to innovation and good management. Companies setting the pace on environmental issues will be seen as the leaders of the corporate sector' (Lickiss, 1991).

Is it surprising that a President of the Institute of Chartered Accountants in England and Wales should make such a statement? Today's challenges to business to raise the level of its environmental performance come from many quarters. They arise from new legislation and government regulations, market pressures from the 'green consumer', the interests of stakeholders such as investors and employees, and general public awareness, focused by the activities of environmental groups and reporting in the media. It has become essential for companies to increase their responsibility regarding all aspects of the environment and to adapt existing practices so as to cause less environmental damage. Harnessing this awakening responsibility within the corporate sector is therefore a key element in any strategy for achieving the goal of 'sustainable development' (e.g., Deloitte Touche Tohmatsu International, *et al.*, 1993). Assessing the feasibility of such a strategy requires not only the resolution of scientific and engineering problems, but also attention to the political, economic, social and organisational changes that may be needed. A key factor will be changes in the way in which businesses make decisions that impact the environment, and in this regard it is important to understand how business accounting systems and requirements for accountability for performance may influence corporate decision making. The aim of this paper is therefore to explore the roles that have been suggested for company reporting of environmental policy, goals and achievements.

An external report can be an important element of the 'social control' of a company's internal behaviour but for any such reporting to be substantive, it needs to be the output of an internal system of management control and reporting (just as annual financial statements are the output of an internal system of management accounting and reporting).

Moreover the relationship between measures of accountability that it is feasible to adopt and their effect on managerial behaviour has always been problematic (Ezzamel, *et al.*, 1990). This paper¹ therefore aims to explore the significance of developments that are being made in the 'greening' of accountancy, both for external reporting and internal management decision-making and control, and to outline some of the problems that accountants face in extending these developments.

The structure of the paper is as follows:

The next section focusses on recent developments in corporate reporting to external stakeholders and, after outlining the kinds of recommendations that have been made both in academic literature and by various official bodies, analyses how businesses are responding to these challenges. The major inhibitor of development is argued to be the current lack of development in related internal management reporting, decision making and cost accounting systems.

The following section therefore explores the kinds of changes that are needed in internal systems if companies are to change their decision making towards greater environmental responsibility. It looks both at 'technical' accounting changes such as the redefinition of 'relevant costs' and at the organisational changes, including changes in incentive systems, that are needed if technical changes are to be effective. Here attention to the factors that are inhibiting change is of crucial importance. The particular problems of bringing smaller enterprises on side are also briefly addressed.

Following these discussions of how the current role of accounting might be extended and adapted to support changes in corporate decision making with regard to the environment, the last section addresses the need to understand both the inherent limitations of attempts to recast the technical outputs of accounting systems, and also the potential power of a new focus of accountability. It looks at the issues of how far 'environmental costs' to businesses correlate with their environmental impacts; and the respective roles of 'physical' vs 'financial' measures of environmental impacts. More fundamentally it suggests, given the historical parallels with the

problematic development in the nineteenth century of accounting for product costs, and the debates between engineers and accountants then over how they should be measured, that there is a need now for engineers to understand that the development of a new environmental accounting depends not so much on the sophistication of the technical measures that are introduced as on the power to change managerial behaviour that could result from the process of embedding a new accountability for environmental performance.

A final section summarises the paper's conclusions.

EXTERNAL REPORTING

A report of the Environment Research Group (ERG) of the Institute of Chartered Accountants in England and Wales (ICAEW) (Macve and Carey, 1992) recommended² that, as part of the annual reporting cycle, a UK company should publish details of:

- the company's environmental policy;
- the identity of the director with overall responsibility for environmental issues;
- the company's environmental objectives which should be expressed in a way that enables performance against them to be measured. It is desirable that, as far as possible, environmental targets and performance be reported on in quantifiable, technical or financial terms;
- information on actions taken, including details of the nature and amount of expenditure incurred, in pursuit of the identified environmental objectives;
- the key impacts of the business on the environment and, if practicable, related measures of environmental performance;
- the extent of compliance with regulations and any industry guidelines including, if applicable, whether the company's sites are registered under the European Community's (EC) eco-audit scheme and the details relating to applications and approvals for registration under British Standard 7750: Environmental Management Systems;

- significant environmental risks not required to be disclosed as contingent liabilities;
- key features of external audit reports on the enterprise's environmental activities, including those relating to particular sites.

Should any of this information be provided in a document separate from the company's annual report and accounts, the latter should contain a reference to the availability of that document.

Practice to date has been patchy. Recent survey evidence (e.g. Macve and Carey, 1992; Butler, *et al.*, 1992; FEE, 1993; KPMG, 1993) points to a very limited response by UK companies generally to reporting on environmental issues. There are, however, some signs that the situation is improving. Over the last three or four years it has become normal for the very largest UK companies to include information on environmental issues in, or in conjunction with, their annual reports. Some of these companies provide an extensive review. Within Europe the level of disclosure of environmental information appears higher in Germany than in any other country (Roberts, 1991). Much of the information currently provided in the UK remains non-specific. Emphasis is on statements of policy, with relatively little quantification of technical or financial factors, with a few exceptions where quantified achievements against targets are provided by companies such as ICI, BT and IBM-UK.

Even when quantification is provided only a few financial implications are mentioned. For example, ICI's environmental report presents the annual total of its 'environmental expenditure' and gives the costs of some individual new plants. It also refers to some of the financial savings achieved through reductions in waste and in energy and water usage. Last year British Petroleum (BP) devoted nearly a full page of the Financial Review section of its 1993 annual report and accounts to environmental investment. BP estimated its 1993 operating expenditure on pollution prevention, control, abatement or elimination to be £200m, although its chief financial officer added that environmental expenditure is difficult to identify because it is embedded within other day-to-day operating costs. In addition BP charged about £160m against profits for

'environmental remediation' programmes at service stations and other sites. Capital investment was about £250m. In its accounting policies BP has a section on 'environmental liabilities' and provisions for environmental restoration stood at £345m at the end of 1993, while provisions for dismantling costs stood at £1,530m. There was also discussion of potential contingent liabilities (Accountancy, 1994).

Information on environmental costs in financial statements (or notes thereto) is more common in the US where there are Securities and Exchange Commission (SEC) and Financial Accounting Standards Board (FASB) requirements relating to disclosure of such information (Macve and Carey, 1992, pp. 22-4). Over 25 percent of the US companies surveyed by KPMG (1993) gave some information on environmental expenditures. There is increasing debate around the world as to what extent more explicit guidance should be given by regulators and accounting bodies to companies on their reporting of and accounting for environmental costs.

To date, most of the concern regarding financial accounting has focused on issues such as the reporting of contingent liabilities for environmental restitution costs and/or penalties, and of impairment to land and other asset values. There are issues that need to be dealt with under ordinary accounting and reporting requirements. They differ, in their environmental aspects, mainly because their potential financial impacts may prove larger by an order of magnitude than those that companies have previously faced. As such they are of enormous potential concern to investors and lenders (and hence to regulators such as the SEC).

The fear of litigation, and of raising further the level of stakeholders' expectations, are factors inhibiting the adoption of more extensive environmental reporting by more companies. The major inhibitor, however, is the inadequacies of internal environmental management systems. Few companies have systems 'that allow them to produce this kind of data and therefore many have a significant hurdle to jump before they can produce an environmental report for public consumption' (KPMG, 1993, p.iii).

INTERNAL SYSTEMS

Changes needed in internal systems comprise both organisational and technical changes. 'Top-down' mission statements are inadequate without a wholesale change in management culture 'from top to bottom' and in the education, training and incentives provided to lower managers and other employees.

To effect these changes several steps may be taken (Macve and Carey, 1992). Management should establish clear lines of responsibility on environmental matters and give a board member overall responsibility for such issues. The company should set out its environmental policy, prioritize objectives and develop information systems for monitoring performance. This is needed both for external regulation and reporting and for internal decision-making and control. The structure and systems adopted should be integrated with the company's mainstream management structure and systems. This is necessary to provide clear signals and incentives for action at all levels throughout the organization. There should be an internal environmental auditing programme to ensure environmental policies are being properly implemented. Companies in which environmental incidents, e.g. an oil spillage, may arise should establish procedures for managing such an event.

The evidence that companies are achieving such changes internally is even more patchy than that for external reporting. It is not yet clear whether this is because the changes have not yet taken place, or because researchers have not yet investigated them adequately and published their findings³.

Technical costing changes

It is argued that conventional accounting systems inhibit environmentally oriented actions and expenditures because the costs that are reported - and included in investment appraisal budgets - focus on the immediate direct costs of actions, processes and products and ignore the levels of costs at which savings are most likely to occur - the indirect costs and the longer term costs. The accounting systems also fail to evaluate the potential benefits from environmental decisions. Thus an exercise by the US Environmental Protection Agency (EPA) and Du Pont, and a similar exercise in the UK on individual sites in the Aire and Calder Valley, showed that there are 'many

pollution prevention projects with paybacks of less than a year which are not being implemented', whether because of competition for management attention or the difficulties of identifying the relevant causal factors (Bennett and James, 1994). A change in approach is needed if companies are to move from 'end of pipe' clean-up solutions to preventative design.

In order to provide a disciplined framework for evaluating all relevant costs, the EPA has developed the 'Total Cost Assessment' (TCA) method, and experiments have been undertaken to investigate the effect on decision making about pollution prevention projects in the pulp and paper industry (Tellus Institute, 1992). In the two projects studied, the new recognition of costs resulting from not adopting the prevention measures (in particular future liability costs and foregone energy savings for fresh and wastewater pumping and treatment, and for freshwater heating) improved the financial acceptability of the prevention investment on all normal decision criteria (net present value - NPV; internal rate of return - IRR; and payback).⁴

TCA focuses on recognising a number of tiers of costs:

Tier 0	Direct costs only
Tier 1	Tier 0 + indirect costs ('overheads')
Tier 2	Tiers 0 + 1 + legal liability costs
Tier 3	Tiers 0 through 2, + intangible costs and benefits

Conventional accounting systems and evaluation procedures measure the indirect costs at Tier 1. They, however, suffer either from not tracing these costs to processes and products or from allocating them in an arbitrary fashion which distorts their decision-relevance (Todd, 1994). Tiers 2 and 3 may not be recognized at all.

There is however a paradox here. The whole thrust of the Tellus/EPA approach is that environmental activity such as pollution prevention is in companies' own self-interest. Environmental costs are also companies' costs - but companies are failing to achieve what is in their best interests (and thereby environmentally beneficial) through the inadequacies of their cost accounting systems. Companies are thereby needlessly causing environmental damage which it is

in both their own and society's interest to reduce. This must give rise to a concern that 'market based' incentives (such as taxes and tradeable pollution licences) may not be effective if companies are unable to recognize the relevant costs and benefits.

The approach also raises the organizational issues of why current accounting systems are inadequate. The Tellus Institute (1992) points to the additional complexities of the evaluation procedures it recommends, and the additional time needed to undertake them. A cultural change is needed if managements are to give sufficient priority and attention to such schemes to enable them even to compete with other potential investments and activities in being regarded as potential options and to get included in the capital budgeting process. If they do not get over that first hurdle there will be no opportunity for the analytic procedures of TCA to demonstrate their merits.

There are also controversial aspects of the TCA methodology. For example the time horizons may need to be extended to capture the most significant costs and benefits (especially relating to future liability). There is the wider issue of whether the discount rates normally used (reflecting capital market requirements) properly reflect 'social time preference' as between current and future generations (Tellus Institute, 1992; Milne, 1994).

TCA itself has been argued to be incomplete - its tiers 0 and 1 cover the relatively certain costs, and its tiers 2 and 3 the probable costs and benefits. But a management thinking strategically about environmental issues and likely changes in pressures from external stakeholders should also be considering possible future costs and benefits arising from, for example, new regulatory requirements or changes in consumer perceptions. The emphasis must be on the total 'life cycle' costs and benefits to the company⁵, from current, future and potential perspectives. Here there is a potential link to the need for accounting to develop ways to measure impacts on the environment. What are 'externalities' today may become internalized costs (whether through regulatory or fiscal measures) in future (Bennett and James, 1994).

Companies have begun to move up the TCA tiers - Bennett and James (1994) have interviewed companies, including Rhone-Poulenc, Baxter Healthcare and 3M, who have identified ways to save costs by expanding their identification of relevant environmental costs.

Organizational changes

There have also been attempts to identify the organizational difficulties that inhibit such developments⁶. Apart from the additional complexity of TCA calculations (e.g. Tellus Institute, 1992), tracing relevant environmental costs may cut across traditional organizational divisions. Information may need to be collated from various functions (sales and marketing, manufacturing, purchase, supply, R&D, finance, personnel etc.) (Houldin, 1993) and responsibility may need to be relocated⁷. For example, are decisions on environmental factors currently exclusively allocated to the legal department or to specialist environmental managers rather than being integrated across the organization (e.g. Epstein, 1994, p.12)? Such integration may alter the patterns of internal incentive structures, product profitability and managerial responsibility. Such change, therefore, may be resisted by managers who have vested interests in the status quo (Todd, 1994).

Thus positive steps, which may require external regulatory stimulus, are needed to overcome organizational inertia. It does not appear likely that this initiative will come from accountants themselves.

A recent study of the attitudes of accountants, based on a questionnaire survey of the finance directors of the 1,000 top UK companies (Bebbington, *et al.*, 1994), indicates that a significant proportion (over 50 percent in the case of energy issues) have introduced, or are at least thinking about introducing, some accounting, whether in financial or statistical terms, for environmentally related activities (in particular for energy, investment appraisal, wastes, packaging and aspects of legal compliance). However, there are also surprisingly high proportions of accountants who have no plans about, or even claim never to have heard of, any of these issues, with two-thirds or more expressing such negative views about issues such as packaging, legal compliance, environmental budgets, water pollution, recycling, contingent liabilities, remediation costs, air

pollution, land pollution, sustainability and life-cycle analysis (Bebbington, *et al.*, 1994, Table 2).

Where companies are undertaking relevant activities, the extent of accountants' involvement does not appear to be high (the mean response on a scale of 1(low) - 5(high) only rising above 3 for the activity 'disclosure in financial statements') (Bebbington, *et al.*, 1994, Table 3).

By contrast, the attitudes expressed by accountants indicate enthusiasm for innovation and development of new systems, recognition of increasing regulatory demands (especially from the UK Government and the EC) and overall support, even if lukewarm, for recognition of companies' environmental responsibility, of stakeholders' rights to information about companies' environmental performance, and of the need for accountants to be involved in the preparation of such information (Bebbington, *et al.*, 1994, Table 4).

Thus the accountants' self-perception appears to conflict with their actual involvement in companies' environmental developments. While there is some slight correlation between the attitudes expressed and the actual extent of their own employer organization's environmental disclosure practice, overall the attitudes are very homogeneous and therefore appear to reflect accountants' personalities and professional training and culture as a group. The researchers therefore speculate that there may be aspects of the nature of professional accountancy training (emphasising financial measures, precision, prudence and resistance to change - caricatured as 'the bean-counters who say "no"') which inhibit them from initiating, or even responding readily to, change. The 'official pronouncements' from their professional bodies that support moves towards greater environmental activity (such as Macve and Carey, 1992) have so far largely washed over accountants in practice.

Companies also seem unsure how to utilize the accountants' potential contribution. Bebbington, *et al.* (1994, p.119) quote 'a senior finance director whose company is one of the UK's leaders in responding to the environmental agenda':

"We found it extremely difficult to see how we could put these things [environmental matters] into the accounting records...accounting approaches encourage short-term

attitudes - community investment, like environmental investment, requires a long-term attitude."

Incentives

The critical problem of performance assessment has bedevilled many environmental initiatives:

'Ex ante control... does not guarantee success. That is, the ex post audit and evaluation must take explicit cognizance of the environmental criteria. This is especially difficult in highly decentralized organizations. For example, Albright and Wilson's early environmental response was to set internal BATNEEC⁸ across all sites. Managers soon learned, however, that if they failed to meet financial targets, as opposed to environmental, BATNEEC, considerations they were penalized' (Gray, et al., 1993, p.155).

Epstein (1994, p. 15) reports on innovations at Browning-Ferris Industries in the USA where 'one-third of total compensation is at-risk pay based on performance, and the environmental component is integrated through the use of an "environmental multiplier". The amount of the individual's bonus based on business-unit and other performance variables is multiplied by an environmental performance score. Thus, employees receiving a score of 80 out of 100 on meeting the environmental objectives, receive 80 percent of their bonus. A score of less than 70 is considered unacceptable; a multiplier of 0 is assigned and the entire bonus lost. It is with such approaches that corporations can effectively change their cultures and provide for a significant change in the environmental sensitivity of all employees at all levels.'

Such developments in incentives do not seem to be widespread at present. Yet 'individuals are essential elements of the sustainable development process, both as decision-makers in the company and as decision-makers in the high street. The implication is that sustainability can no longer be decoupled from individual responsibility' (Whelan, 1994, p.16). If the accounting incentive-reward structure for individual organizational members is not brought into line with environmental objectives it will be difficult for the organization as a whole to respond effectively

to the environmental challenge. Initiatives, such as those at Monsanto, where 'an internal tax is imposed on all internally generated waste, thereby doubly penalizing - and doubly motivating - management responsible for waste production' are pointers to the kinds of developments that may be experimented with (Gray, *et al.*, 1993, p.135).

Small firms

A particular issue, identified in the UK Government's recent White Paper on sustainable development (UK Government, 1994), is that of how small firms, including agricultural enterprises, are to be incentivised to adopt more environmentally responsible behaviour . Their access to information about environmental issues and opportunities may be much more restricted than that of larger firms. For such firms, cost savings from environmental investment may also differ from those for larger firms. For example, savings in labour costs may not be apparent if a firm's labour costs are a function of what the company can bear rather than the real workload (Tellus Institute, 1992, p. 50) and there may be other diseconomies of scale. However Epstein (1994, p.18) provides the example of Hyde Tools in Massachusetts, which employs some 300 employees and uses 'sound business analysis to improve both its bottom line and the environment'. The company has eliminated use of toxic chemicals, and achieved enormous reductions in waste water (from 29 million gallons to 1 million gallons in three years).

THE ROLE OF ACCOUNTING IN ENVIRONMENTAL DECISIONS

The previous sections have reviewed some recent developments in external environmental reporting and adaptations to internal costing systems to better capture relevant costs for environmental decisions and refocus management's priorities. In this section I look at three of the major issues which remain problematic however, both theoretically and in practice. First is the problem of whether the environmental costs to a business can be regarded as equivalent to costs to the environment; second is the nature of the respective roles of quantitative physical measures

and financial measures; and third is the fundamental nature of accounting's methodology for identifying costs.

Costs of or to the environment?

Most of the initiatives discussed above deal with environmental impacts on companies such as the potential liabilities or asset impairments that may need to be reported in external financial statements; and the potential cost savings and other benefits that may need to be recognized if companies are to take appropriate action to reduce waste, prevent pollution etc.. By responding to these impacts companies may benefit both the environment and their own 'bottom line'. But this approach avoids those areas of conflict where what is good for a company's bottom line is harmful for the environment because the externalities that it imposes do not presently have to be internalized - through regulatory or fiscal mechanisms - as its own costs. Thus reporting of expenditure on environmental clean-up may not signify an 'environmentally friendly' company but an 'unfriendly' company that is doing something to mitigate the environmental damage it is causing. A full accountability needs to extend beyond the company's own costs and revenues to capture impacts on the environment, for example through the developing - but still controversial - approaches of environmental impact assessment (EIA) and 'life cycle analysis' (e.g. Milne, 1994). Clearly, in the present state of the art, any such accounting is fraught with theoretical and practical difficulties (e.g. Cope and James, 1990), although pioneering attempts have been made (e.g. in BSO/Origin's annual reports, illustrated at Macve and Carey, 1992, pp. 57-65). Various bodies (such as the United Nations and International Institute for Sustainable Development) have called for further research and experimentation with such 'natural resource accounts' that measure the impairment of natural and environmental resources, to provide for example a 'sustainable development profit and loss statement based on sustainable development accounting principles' or an environmentally adjusted 'value added statement' (Macve and Carey, 1992, p.75). Moreover it must be remembered that uncertainties and measurement difficulties have not inhibited accountants from reporting intangibles that companies do benefit from, such as research and development, brands and goodwill, when user demands or management requirements and

incentives have been sufficiently strong (e.g. Arnold, *et al.*, 1992). If a company's stakeholders are to receive a full account of its environmental performance the development of an accounting for these externalities is a priority for research and practical experimentation.

Physical or financial?

'You can't manage what you can't measure'

'Change what you count and you change what counts'

The potential for quantification of targets and achievements through physical measures - tonnes of hazardous wastes, proportions of recyclable materials, concentrations of particulate emissions, etc. - is clear, and such measures are already illustrated in the publicly available reports on pollution control including, increasingly, companies' annual environmental reports (Collier, *et al.*, 1993). Internally such measures may also be used as part of an array of targets and performance indicators within a 'balanced scorecard' (e.g. Epstein, 1994, p.19). The increased use of non-financial measures, at least at lower levels of organizations, is also a feature of modern management control systems with their focus on quality and continuous improvement, and is of increasing importance where organizations promote 'bottom-up empowerment' rather than 'top-down control' and are downsizing and flattening their structures (e.g. Epstein, 1994; Tyson, 1994). However, the power of the 'financial bottom-line' has always made it accountancy's strongest weapon, both in its apparent capability to summarize organizational performance across a diverse range of divisions, activities and products and in its behavioural linkages to incentives and rewards (e.g. Ezzamel, *et al.*, 1990). Despite the major reorientations of management accounting systems in recent years, top managements are likely to continue to 'manage by the financial numbers' (e.g. Tyson, 1994, p. 28). The need both to capture internal environmental considerations in terms of financial consequences (as in TCA) and to attempt to measure financially external impacts from the organization on the environment is a major challenge for the further development of environmental accounting (Cope and James, 1990).

Increasing quantification (whether physical or financial), however, carries its own dangers. It gives a spurious objectivity to numbers that often reflect highly subjective and judgemental assumptions and estimates. It marginalizes those factors that must remain qualitative (and whose subjectivity is thereby further emphasised) but which may be the more important. The interpretation of accounting numbers remains therefore equally as, if not more important than, the actual numbers themselves. The numbers should provide the means to sharpen up analysis and questioning but do not in themselves provide the answers and certainly not the complete answers.

The nature of accounting costs

In calling for technical improvements in accounting systems to better capture environmental costs and impacts it is necessary to understand both the limitations of accounting numbers and the power that the process of embedding a new accountability has to change managerial decision-making and organisational behaviour. This is illustrated by the nineteenth century development of early cost and management accounting.

Since the nineteenth century engineers, followed by accountants and, more recently by managerial economists, have focussed on the nature of business costs (Wells, 1978). It has been argued in an influential book (Johnson & Kaplan, 1987) that early cost management, focussing on estimates, was a common-sense and useful activity which assisted management decisions. But it later became enmeshed in the accountants' routines for systematic recording and overlaid by the concerns of external financial reporting, thus 'losing its relevance'. However, I would argue that the nature of cost accounting may alternatively be seen as having always been problematic. It was primarily engendered by a new managerialist concern with standards of human performance - standards which do not have the neutral objectivity of physical engineering standards, not least because human beings react to (e.g. by internalizing) the standards by which they are appraised (Ezzamel, *et al.*, 1990).

The central technical problem has always been the treatment of indirect or overhead costs, in particular in multi-activity and multi-product firms. The 'practical' approach was to regard overhead as just another cost which 'attached' to units of product like direct costs (Wells, 1978). In order to find the 'true' unit cost of a product such indirect costs needed to be allocated in a systematic way - and the arithmetical accuracy of the calculations gave an appearance of objectivity to the resulting answers.

Both engineers and accountants argued long and hard over what were the 'correct' ways to carry out such allocations. Engineers favoured systems that purported to identify the physical causal relationships in operation, however remote those causal links. This approach has recently gained a new lease of life in the activity based costing (ABC) systems that now attempt to trace costs to

their 'cost drivers' (eg. Tyson, 1994). However, from an economic and decision making perspective such allocations are inherently arbitrary and largely if not totally irrelevant. Cost does not create value. Value is based on the interaction of supply and demand. For economic decisions, what matters is how costs will change as a result of each decision. Therefore the concern is whether the extra revenue or other benefits the decision will bring are worth the extra costs. Such impacts of decisions are unlikely to be captured by routine reports of past costs, allocated in some inherently arbitrary fashion, however arithmetically precise⁹.

The nineteenth century engineers' concerns with identifying 'true' total cost were therefore misplaced. The engineers' approach was believed to be a 'scientific' approach to identifying causes and effects. This led them to defend what are essentially indefensible allocations (Wells, 1978). However, the accountants' parallel concerns in identifying 'true' total cost reflected a different motivation, which arguably explains the accountants' later dominance in management (accompanied, at least in the UK, by higher social status and greater material rewards (French, 1994)). Their approach is best understood as focussed on the development of systems of accountability and responsibility for costs and profits that would provide norms and standards of human performance. These norms and standards could be linked to incentives and internalized by organizational members, from shop-floor workers to top managers, in a reciprocal hierarchy of surveillance, control and self-control (Ezzamel, *et al.*, 1990). Its success lay not in its creation of a new 'scientific' knowledge about costs but in its power to stimulate successful organizational performance. It was a new 'power-knowledge' (Hoskin & Macve, 1994). 'Cost' is therefore not an objective engineering datum about a product or process - it is constructed, through conventions, for an economic and social purpose.

There is a continuing tension between the engineers' 'objective' efficiency perspective and the accountants' more subjective, economic and behavioural perspective on business activity and on how to control performance. This tension sometimes amounts to hostility (French, 1994). In the context of UK pollution control this tension is focussed in the concept of BATNEEC whereby scientific and technical features are balanced, if not subordinated, within managerial disciplines

such as cost accounting. Thus the UK's Department of the Environment has been characterized as strong in engineering but not in management disciplines such as accounting and as needing strengthening in these latter skills (Power, 1994).

The final challenge for 'environmental costing' therefore is not just to increase the technical sophistication by which environmental factors are traced through to activities. It has to construct a new accountability that is linked to real incentives. Only then can environmental performance become as culturally dominant in management for sustainable development as, for the last one hundred and fifty years or so, financial performance has become in the kind of business management that has, in large measure, created the 'problem' of the environment.

CONCLUSIONS

In response to various pressures, businesses have begun to report externally on their environmental policy and performance. The significance of such external reporting depends on the extent of changes in management culture and systems and on how new measures influence management decisions. The 'greening of accountancy' involves a reappraisal of how to identify and measure the relevant costs of processes and products (such as 'Total Cost Assessment') and a redesign of incentive mechanisms.

Through these changes managerial decisions and corporate behaviour may be refocused towards the goal of achieving sustainable development, for example by pursuing a viable industrial ecology.

Evidence to date suggests that organizational inertia, including the relative lack of involvement on the part of accountants themselves, is inhibiting such changes. There is however a paradox that improving environmental performance is often advocated as remedying defects in a company's assessment of their own self-interest.

This new role of accounting is at present embryonic. A number of theoretical and practical issues need research and experiment if its potential is to be realized. There is a need to recognize a new dimension, namely costs which represent environmental benefits (and vice versa). The

appropriate balance between the roles of physical and financial performance indicators is not yet established. Moreover the fundamental relationship between accounting and management decision making has always been problematic. The nineteenth-century debates between engineers and accountants illustrate both the subjectivity of the nature of 'cost' and the powerful effects of its construction as part of a new system of accountability. A reorientation of accountability to focus on environmental performance is the major challenge in the "greening" of accountancy.

FOOTNOTES

- 1 This paper draws in part on the report (Macve and Carey, 1992) of the Environment Research Group (ERG) of the ICAEW which was chaired by the author. Group members included accountants, auditors, academics, business managers, investment analysts, economists and civil servants.
- 2 In compiling its recommendation the ERG of the ICAEW drew on reports, such as those of the International Chamber of Commerce, the UK '100 Group' of Finance Directors, the International Institute for Sustainable Development (IISD), the UN, the EC Commission and others such as Deloitte Touche Tohmatsu International/ISD/SustainAbility, 1993
- 3 A major study currently underway in the USA on "The Measurement and Reporting of Corporate Environmental Performance" sponsored by the Institute of Management Accountants (Epstein, 1994) may shed light on the extent of changes in internal systems and barriers to change.
- 4 Kreuze, *et al.*, 1991 and Bailey, 1991 contain worked examples of TCA.
- 5 This should not be confused with the 'life-cycle analysis' of external environmental impacts discussed below, except that such analysis may identify costs and benefits that will in future possibly impact the company as regulations or fiscal incentives change (e.g. Bailey, 1991).
- 6 Similar failures of present cost and management accounting systems have also been identified in relation to non-environmental investment decisions which involve long-term and/or intangible benefits - including improvements in cost and management accounting systems themselves (e.g. Tyson, 1994).
- 7 Again similar complexities arise in tracing costs to 'cost drivers' in modern activity based costing (ABC) systems (e.g. Tyson, 1994).
- 8 BATNEEC (Best Available Technology Not Entailing Excessive Costs) is the criterion utilized by Her Majesty's Inspectorate of Pollution (HMIP) in the UK in assessing acceptability of processes (e.g. Slater, 1994, p.10).
- 9 The history of cost accounting is replete with examples of situations where divisions, processes or products appeared unprofitable under the basis of overhead allocation adopted, so that the management wisely changed the basis (e.g. Wells, 1978, p.84).

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