

performance through a single piece of software (such as SAP Strategic Enterprise Management; *SAP SEM*.)

For example, SAP's SEMs supports:

- **Financial reporting** – it can generate financial and management account information to allow managers to monitor the financial performance of business units and divisions
- **Planning, budgeting, and forecasting**
- **Corporate performance management and scorecards** – the software allows managers to develop KPIs that support balanced scorecards and economic value-added scorecard methodologies. The software allows managers to link both operational and strategic plans and to develop scorecards and performance measures based on both financial and non-financial data.
- **Risk management** – the software helps managers identify, quantify, and analyse business risks within their business units and thereby to identify risk-reducing activities.

4.3 The future

For as long as budgetary control **based on money** remains central to the co-ordination and control of organisations, management accounting information will retain its **central place** within the overall management information system. Financial information will always be extremely important because commercial organisations aim to make profits and even non-profit-making organisations or public sector bodies must break even financially or keep spending within budgeted limits.

The **role of the management accountant** and the **type of information** he is expected to provide is **changing**. **Developments in information technology** mean that almost instantaneous feedback can in theory be obtained at the touch of a button. The impact on the traditional management accounting function could be profound.

5 Lean management information systems

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Lean production is a manufacturing methodology developed originally for Toyota. It is also known as the Toyota Production System. Its goal is 'to get the right things to the right place at the right time, the first time, while **minimising waste** and being open to change'. This lean philosophy can also be applied to services and systems.

In this section we start off with a quick overview of lean systems before we move on to look at how lean would be used in a management information context. We finish with a look at some general benefits and criticisms of lean systems.

Lean production is a philosophy of production that aims to minimise the amount of resources (including time) used in all activities of an enterprise. It involves identifying and eliminating all non-value-adding activities.

The concepts behind lean production may also be applied to services and systems in the organisation. To summarise, the lean philosophy (lean) requires the organisation to focus on:

- Continuous improvement
- Increased productivity
- Improved quality
- Improved management ✓

Lean involves the systematic elimination of waste, and Toyota identified aspects of this as:

- **Over-production** and early production
- **Waiting** – time delays, idle time, any time during which value is not added to the product
- **Transportation** – multiple handling, delay in materials handling, unnecessary handling
- **Inventory** – holding or purchasing unnecessary raw materials, work in process and finished goods
- **Motion** – actions of people or equipment that do not add value to the product
- **Over-processing** – unnecessary steps or work elements/procedures (non added value work)
- **Defective units** – production of a part that is scrapped or requires rework

Lean should eliminate waste, and lead to improved product flow and improved quality. Instead of devoting resources to planning what would be required for future manufacturing, lean production focuses on reducing system response time so that the production system is capable of rapid change to meet market demands.

5.1 Characteristics of lean (based on lean production)

The characteristics of lean are:

- (a) Integrated single piece continuous workflow.
- (b) Integration of the whole value chain through partnerships with suppliers and distributors.
- (c) Just in time processing: a part moves to a production operation, is processed immediately, and moves immediately to the next operation.
- (d) Short order-to-ship cycle times and small batch production capability synchronised to shipping schedules.
- (e) Production is based on orders rather than forecasts and is driven by customer demand or 'pull'.
- (f) Minimal inventories at each stage of the production process.
- (g) Quick changeovers of machines and equipment.
- (h) Production layout based on product flow.
- (i) Active involvement by workers in problem solving to improve quality and eliminate waste.
- (j) Defect prevention (rather than inspection and rework) by building quality into the process.
- (k) Team-based work with multi-skilled staff empowered to make decisions.

5.2 Applications of lean to management information systems

During the 1980s lean production methods were adopted by many manufacturing plants in the US and Europe, with varying degrees of success. Recent years have seen a renewed interest in the principles of lean production, particularly since the philosophy encourages the reduction of inventory. Dell Computers and Boeing Aircraft have embraced the philosophy of lean production with great success.

Lean techniques are applicable not only in manufacturing, but also in a service environment. Every system contains waste (ie something that does not provide value to the customer).

An article by Hicks in the *International Journal of Information Management* (Lean information management: Understanding and eliminating waste (2007)) considers the way 'lean' ideas can be applied to information management and information systems.

Lean thinking in this context aims to add value to the information provided by the system, and there are three levels at which it can do this.

First, lean can enhance the value of the data in the system and how it is organised, exchanged and retrieved. Waste arises from effort or difficulties in retrieving and accessing information. It also arises from having to correct inaccurate information.

At a second level, lean thinking can add value to information by virtue of how the information is organised, and presented, for example by not including unnecessary detail.

Thirdly, value can be added by enabling the information to flow to the users of the information more efficiently, by addressing the processes of exchange, sharing and collaboration between the management accountants and the managers in a business.

Overall, the lean approach would seek to identify and concentrate improvements on eliminating waste and improving the flow of value from the management information system. The ultimate aim is to improve efficiency, productivity and quality of information. However, measuring waste and defining value are more difficult when looking at information systems compared with manufacturing where there are established methods for identifying waste and measuring performance are well established.

Moreover, there is always scope for improvement in the way information is managed and shared with users.

5.3 Benefits of lean production

Supporters of lean production believe it enables a company to deliver on demand, minimise inventory, maximise the use of multi-skilled employees, flatten the management structure and focus resources where they are most effective.

Other benefits include:

- Waste reduction (up to 80%)
- Production cost reduction (50%)
- Manufacturing cycle times decreased (50%)
- Labour reduction (50%) while maintaining or increasing throughput
- Inventory reduction (80%) while increasing customer service levels
- Capacity increase in current facilities (50%)
- Higher quality
- Higher profits
- Higher system flexibility in reacting to changes in requirements improved
- More strategic focus
- Improved cash flow through increasing shipping and billing frequencies

5.4 Criticisms of lean principles

In many situations, an organisation supposedly using lean principles has not experienced the improvements in productivity and profitability expected. It is difficult to know whether this is due to shortcomings in the lean philosophy or whether the techniques involved are being interpreted and applied correctly.

For example, the 5'S's concept is often associated with lean principles and is underpinned by the idea that there is 'a place for everything and everything goes in its place.' The 5 'S's concept should be used with the aim of creating a workplace with real organisation and order, which creates employees' pride in their work, improves safety, and results in better quality.

The 5'S's are:

Seiri (or Structurise) - Segregate or discard. Introduce order where possible.

Selton (or Systemise) - Arrange and identify for ease of use. Approach tasks systematically.

Seiso (or Sanitise) - Clean daily. Be tidy, avoid clutter.

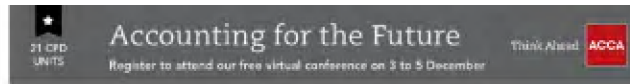
Seiketsu (or Standardise) - Revisit each 'S' frequently. Be consistent in your approach.

Shitsuke (or Self-discipline) - Sustain via motivation. Do the above daily.

However, in some organisations, 5S has become a cleaning and housekeeping exercise only, and the underlying philosophy behind the concept has been lost.

To be successful, lean techniques should be seen and treated as outward signs of a more **fundamental approach** to operations and quality. However, many organisations seem to treat the techniques as the end itself – they have a mistaken belief that simply putting structures and mechanisms (eg quality circles) in place will improve efficiency and quality. **Sustainable differences** require a change in thinking and in culture – which are difficult to achieve.

Lean production is often viewed as a simple **cost-cutting exercise** rather than a fundamental commitment to eliminating waste and adding value. Many companies use lean manufacturing and Six Sigma techniques to improve quality and reduce costs. But the benefits most businesses realise are only a fraction of what could be achieved if these strategies were applied over a better foundation of business plan deployment, levelling of resources and an engaged workforce.



Think Ahead

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Human resource management and the appraisal system

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This article looks at the **nature of human resource management**, and at the link between human resource management and **performance management**. It then examines aspects of the staff appraisal system, and considers the impact of these on the performance of an organisation.

Nature of human resource management

Human resource management is defined by Bratton as **'a strategic approach to managing employment relations, which emphasises that leveraging people's capabilities is critical to achieving competitive advantage.'** (1)

From this definition, we can see that human resource management has grown in importance from the traditional view of the personnel department, whose role was primarily seen as that of hiring and firing employees to a much broader role. Human

resource management includes the recruitment of employees, the development of policies relating to human resources, and the management and development of employees.

It also follows that human resources management is not carried out exclusively by the HR department. Line managers are involved in managing the human resources in their departments.

Importance of human resources

The modern terms 'human resources' and 'human capital' reflect the increasing recognition of the strategic importance of employees. The terms actually refer to the traits that people bring to the workplace, such as knowledge, intelligence, enthusiasm, an ability to learn, and so on. Employees are seen less and less as an expensive necessity, and more and more as a strategic resource that may provide an organisation with competitive advantage.

In service industries such as restaurants, for example, where employees have direct contact with customers, having employees that are friendly and helpful has a large impact on how customers will view the business. In IT industries, having staff with good technical knowledge is essential.

The problem with human resources is that they require more management than other factors of production. We humans are complex, emotional creatures, and it can be challenging to ensure that we behave in the right way, remain motivated and give our best to the employer. William James, the 19th century American sociologist, once remarked that most people only use 15% of their combined intelligence, skills and aptitudes in their employment. Whether this still remains the case or not, it is clearly a challenge to get employees to contribute more of their abilities in the workplace.

Strategic human resource management

Given that human resources are a strategic capability, many human resource practitioners talk about 'strategic human resource management'. This means aligning the human resource management of organisations with the organisations' strategy.

The human resources management process should support the corporate strategy by:

- ensuring that the organisation has the right number of qualified employees
- employees have the right skills and knowledge to perform efficiently and effectively
- employees exhibit the appropriate behaviours consistent with the organisation's culture and values
- employees meet the organisation's motivational needs.

A low-cost supermarket, for example, may have an HR policy of recruiting unskilled staff, who are prepared to work for low wages, but would not provide customers with excellent service. A more upmarket supermarket on the other hand would want to

provide excellent customer care. HR strategies would include the recruitment of individuals who have excellent personal skills, and training of all staff in customer care.

Recruitment and selection

'Recruitment is the process of generating a pool of capable people to apply to an organisation for employment. Selection is the process by which managers and others use specific instruments to choose from a pool of applicants the person or persons most likely to succeed in the job given management goals and legal requirements.' (2)

Recruitment is the first stage in the process of human resource management. The organisation needs to recruit individuals with the right skills, and the right attitudes to contribute to the strategic goals of the organisation. Employees should also have the personality that will fit into the culture of the organisation.

From the point of view of potential employees, the recruitment process provides them with the opportunity to see if the organisation matches their expectations. The organisation should provide honest information about the position so that the potential employee forms the right expectations about the role that they are applying for. If not, this may lead to disappointment and high staff turnover.

When recruiting, the amount of time and effort spent in selecting the right employee depends on the amount of responsibility that the position requires. Managerial or problem-solving positions, where employees would be required to have deeper skills, a higher level of responsibility and greater commitment, thus contributing to the strategy of the organisation, would merit a much greater effort in the selection process. The selection process will need to ensure that candidates should possess the ability to acquire the skills needed, and the attitude that fits the culture of the organisation. Organisations may use psychometric tests to assess candidates for such positions. Psychometric tests are described later in this article.

Lower level employees would be employed if they have the right skills. Less screening would take place for this group of employees.

Competency frameworks

In many organisations, competency frameworks may be developed prior to the recruitment stage. A competency framework shows a set of behaviour patterns and skills that the candidate needs in order to perform a job with competence.

ACCA has developed a comprehensive competency framework for ACCA students to help plan careers in different roles. In ACCA's competency frameworks, competencies are categorised into exams, experience, ethics, job profiles, technical competencies and behavioural competencies. An example of a technical competence relating to management accounting is performance objective 13, *Contribute to budget planning and production*.

Appraisal system

An appraisal is the analysis of the performance of an individual, which usually includes assessment of the individual's current and past work performance. Broadly speaking, there are two main reasons for the appraisal process. The first is the control purpose, which means making decisions about pay, promotions and careers. The second is about identifying the development needs of individuals.

Control objective of appraisals

In recent years, there has been a drive towards linking the appraisal of employees to the strategic objectives of an organisation. The idea is that the organisation sets its own goals and performance measures. These goals are then translated into goals for managers and employees. Measurable targets are identified and set for employees, and their performance against the targets will be used as part of their appraisal.

Appraisal is, therefore, seen as part of management control. By measuring the performance of employees against targets, management is seen to be proactively managing the performance of employees and therefore improving the performance of the organisation.

While such an approach may appear rational, in practice it is very unpopular with employees, who do not like to feel they are being controlled. It can also be criticised for trying to make a complex relationship between employees and managers appear to be too simple. In practice, however, such control models are the most popular models of assessment.

Developmental objectives of appraisals

A second way in which the appraisal system can support performance management is by identifying the development needs of staff and managers. Some organisations use a development centre, where an individual is assessed, often by a qualified occupational psychologist, against the required competencies for his role. Personal development plans are then made to develop the individual in areas where weaknesses are recognised.

Difficulties in appraisal

In assessing employees, managers are required to make judgments about an employee's performance and capabilities. Such judgments are naturally subject to potential bias in favour of some and against others. There are many statistics showing how prejudice may affect the promotional prospects of some groups. In the UK, for example, 40% of the workforce are women, but only 30% of managers are women.

Another difficulty is the effect that negative criticism can have on performance. A study carried out in the 1960s by Meyer, Kay and French (3) investigated the impact of the appraisal process at a factory in the US. The study concluded that where staff are given criticism, they react defensively to the criticism and try to blame others for their shortcomings. They will also become demotivated. Interestingly, praise given during the process had little impact on performance.

One potential solution to the difficulties mentioned above in relation to appraisal is to be aware that, in addition to the formal appraisal process, employees receive continuous informal feedback from their managers on the job. Employees generally accept this informal feedback more readily, and it is more likely to lead to improvement in their performance. Placing more emphasis on this informal type of assessment, and less on the formal appraisal process, may improve the overall performance of employees.

Measurement of performance

When measuring the performance of employees for the purpose of appraisal, three different approaches can be used:

- Measurement of inputs
- Behaviour in performance
- Measurement of results and outcomes

Measurement of inputs

Measurement of inputs means attempting to assess the traits of an individual. Traits are those skills, knowledge and attitudes that the employee possesses. Assessment aims to identify whether the staff member has the competencies (or traits) for a job, perhaps with reference to a competency framework. Attributes such as leadership, commitment, ability to work within a team and loyalty are traits that are typically desired.

Where assessment is performed by the line manager, the subjectivity of the exercise may well lead to real or perceived bias in the assessment. As a result of this, many organisations now use professionally designed psychometric tests.

Psychometric testing aims to 'measure' the abilities and personal skills of an individual. An example of an ability would be the number of words per minute that the individual can type on a keyboard. Personal skills focus on areas such as emotional stability of the individual, whether the individual is introvert or extrovert, and how flexible the employee is.

Some organisations hold 'moderation meetings' for bigger teams. The purpose of these meetings is to ensure that the various managers involved in assessing the different members of staff within a team are doing so consistently.

Behaviour in performance

This type of appraisal looks at the behaviour of the employee during work, and at how the employee applies his or her skills. Both quantitative and qualitative data is collected on a continuous basis relating to how the employee displays the expected behaviour for the position – for example, 'gives praise where it is due to others on the team' might be one of the behaviours looked for.

A common method for assessing behaviour in performance is the use of behaviour-anchored rating scales (BARS). Descriptions of desired (and undesirable) behaviour are listed, and the appraiser gives a score for each one. A good example of BARS is the course assessment forms used by many ACCA tuition providers, where students are asked to rate the tutor on various attributes, such as 'clarity of explanations', and 'approachability'. Students then give the tutor a grade for each of these attributes – for example, from 1 to 5, where 5 is excellent, and 1 is poor.

Behavioural observation scales (BOS) are where specific actions are listed, and the appraisee is judged on how many times he performs that action. For example, how often does a supervisor provide constructive feedback to colleagues?

An obvious problem with BARS and BOS is the subjectivity involved. BOS are designed to be slightly less subjective as they are based on the number of times behaviour is observed, which is more factual.

Measurement of behaviour in performance generally is beneficial because not only is information about the employee's performance obtained, but more detailed understanding of the requirement of the job can be ascertained, and this can be used for defining standards in future.

Measurement of results and outcomes

Under these types of appraisals, individuals are assessed on quantifiable outcomes – for example, the amount of sales achieved by a salesman, the volume of production achieved, the number of customer complaints. Where competency frameworks are used, it may also be possible to measure the number of competencies achieved during a period.

Frequently, targets may be set for individuals and their performance will be judged against these. In setting such targets, it is appropriate to consider the principles relating to the setting of standards from the Fitzgerald and Moon building blocks model. In particular, standards should be achievable, or staff will become demotivated; they should be controllable – that is, staff should not be judged on targets that are outside of their control.

Measurement of results and outcomes is usually easy to perform, but suffers from the problem that it does not take into account the differing external factors that may have occurred. It may also lead to measure fixation among staff, such as the famous example in the call centres, where the performance of call centre staff was measured based on the number of calls per day. It was quite common for call centre staff to keep this high by simply hanging up when presented with difficult customers.

Control mechanisms for employees

Ouchi developed a model for helping to determine what types of controls are most appropriate for employees in different situations:

- Personnel controls, also known as clan controls, are based on fostering a sense of solidarity in the people who work for an organisation. If personnel believe in the objectives that the organisation is trying to achieve, then they will be motivated to work towards those objectives and will not require detailed supervision or control. Personnel controls include recruitment of people with the right attitudes, training and job design. These are closely related to appraisal systems based on inputs.
- Behavioural controls involve observing the employee – for example, the foreman on a production line watches the employees to ensure that the work is done as prescribed. Such controls are consistent with appraisal systems that focus on the behaviour of employees.
- Output or results controls that focus on measuring some aspect of work performed. Examples could include measuring the number of defective products. Appraisal systems based on results or outcomes are examples of output controls.

The type of control system that is appropriate depends on two variables – the ability to measure output, and the knowledge of the transformation process. Ouchi forms a matrix from these two that helps to determine what types of control system are most appropriate for a particular organisation:

		Knowledge of the transformation process	
		<i>Perfect</i>	<i>Imperfect</i>
Ability to measure output	<i>High</i>	Behavioural and or output controls	Output controls
	<i>Low</i>	Behavioural measurement	Personnel controls

Knowledge of the transformation process is low in situations where there is no obvious way to do a task. Those performing the task may have to learn on the job, rather than be provided with a detailed instruction manual showing them how to do it. This may occur in project-based work, for example, where each project brings new tasks and challenges to the project team.

In manufacturing industries, it is likely that it is easy to measure output, and knowledge of the transformation process is high – the tasks have been performed many times before. So behavioural or output controls are appropriate, and appraisal will focus on the behaviour of employees or on results and outcomes.

A situation where the knowledge of the transformation system is imperfect but measurement is easy might be a sales department. Management may not be aware of the exact processes involved by the sales team, and there may not be one 'right way' of making sales. However, measurement of sales is easy to do, so output controls may be used. The problem with this approach, however, is that it does not take into account external factors. It may be difficult to make sales in some markets, for example, and so appraising employees on results alone might be deemed unfair.

The ability to measure output may be difficult in certain activities, such as research work. Where people work in teams, measuring the output of the individuals within the team may be difficult. Some individuals may put in more effort than others, for

example. If knowledge of the transformation process is also low, then the organisation may have to rely on personnel and clan controls. In such situations, the appraisal process may focus on traits.

Linking appraisal to the reward scheme

The appraisal process may be linked to a reward scheme whereby employees or managers earn some incentives, such as promotion or financial incentives if targets are met. Reward schemes were discussed in another article, 'Reward schemes for employees and management' (see Related links).

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References

1. *Human Resource Management, Theory and Practice*, 4th edition, Bratton and Gold, published by Palgrave Macmillan, p3
2. Bratton and Gold, p239
3. Bratton and Gold, p285



Related Links

- [ACCA's Competency Framework](#)
- [Student Accountant hub page](#)

Advertisement

Environmental accounting

2e

Topic list	Syllabus reference
1 Managing environmental costs	A5 (a)
2 Accounting for environmental costs	A5 (b)

Introduction

Environmental accounting is the last management accounting technique in Section A of the syllabus.

Environmental issues are becoming increasingly important in the business world. Businesses are responsible for the environmental impact of their operations and are becoming increasingly aware of problems such as carbon emissions.

The growth of environmental issues and regulations has also brought greater focus on how businesses **manage** and **account** for environmental costs.

Study guide

		Intellectual level
A5	Environmental accounting	
(a)	Discuss the issues businesses face in the management of environmental costs	1
(b)	Describe the different methods a business may use to account for its environmental costs	1

Exam guide

Environmental accounting is becoming increasingly topical in the modern business environment. The July 2010 edition of *Student Accountant*, contains an **article** on **environmental management accounting** written by the **examiner**. Ensure that you are familiar with the main points in this article.

1 Managing environmental costs

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Environmental costs are important to businesses for a number of reasons.

- Identifying environmental costs associated with individual products and services can assist with **pricing decisions**.
- Ensuring compliance with **regulatory standards**.
- Potential for **cost savings**.

Key term

Environmental management accounting (EMA) is the generation and analysis of both financial and non-financial information in order to support internal environmental management processes.

1.1 Environmental concern and performance

Martin Bennett and Peter James ('The green bottom line: management accounting for environmental improvement and business benefit', *Management Accounting*, November 1998) looked at the **ways in which a company's concern for the environment can impact on its performance**.

- (a) **Short-term savings** through waste minimisation and energy efficiency schemes can be substantial.
- (b) Companies with poor environmental performance may face **increased cost of capital** because investors and lenders demand a higher risk premium.
- (c) There are a number of **energy and environmental taxes**, such as the UK's landfill tax.
- (d) **Pressure group campaigns** can cause damage to reputation and/or additional costs.
- (e) Environmental legislation may cause the '**sunsetting**' of products and opportunities for '**sunrise**' replacements.
- (f) The cost of processing input which becomes **waste** is equivalent to 5-10% of some organisations' revenue.
- (g) The phasing out of CFCs has led to markets for alternative products.



On 20 April 2010, multinational oil company BP's Deepwater Horizon rig exploded off the coast of the US state of Louisiana, killing 11 workers. BP chairman, Carl-Henric Svanberg was invited to meet US President Barack Obama amid concerns that the company did not have enough cash to pay for the clean-up operation and compensation for those affected – estimated at \$32.2 billion. The reputation of the global BP brand was seriously damaged.

1.1.1 Achieving business and environmental benefits

Bennett and James went on to suggest **six main ways in which business and environmental benefits can be achieved.**

- (a) **Integrating the environment into capital expenditure decisions** (by considering environmental opposition to projects which could affect cash flows, for example)
- (b) **Understanding and managing environmental costs.** Environmental costs are often 'hidden' in overheads and environmental and energy costs are often not allocated to the relevant budgets.
- (c) **Introducing waste minimisation schemes**
- (d) **Understanding and managing life cycle costs.** For many products, the greatest environmental impact occurs upstream (such as mining raw materials) or downstream from production (such as energy to operate equipment). This has led to producers being made responsible for dealing with the disposal of products such as cars, and government and third party measures to influence raw material choices. Organisations therefore need to identify, control and make provision for environmental life cycle costs and work with suppliers and customers to identify environmental cost reduction opportunities.
- (e) **Measuring environmental performance.** Business is under increasing pressure to measure all aspects of environmental performance, both for statutory disclosure reasons and due to demands for more environmental data from customers.
- (f) **Involving management accountants in a strategic approach to environment-related management accounting and performance evaluation.** A 'green accounting team' incorporating the key functions should analyse the strategic picture and identify opportunities for practical initiatives. It should analyse the short-, medium- and long-term impact of possible changes in the following.
 - (i) **Government policies**, such as on transport
 - (ii) **Legislation and regulation**
 - (iii) **Supply conditions**, such as fewer landfill sites
 - (iv) **Market conditions**, such as changing customer views
 - (v) **Social attitudes**, such as to factory farming
 - (vi) **Competitor strategies**

Possible action includes the following.

- (i) Designating an '**environmental champion**' within the strategic planning or accounting function to ensure that environmental considerations are fully considered.
- (ii) Assessing whether **new data sources** are needed to collect more and better data
- (iii) Making **comparisons** between sites/offices to highlight poor performance and generate peer pressure for action
- (iv) Developing **checklists** for internal auditors

Such analysis and action should help organisations to better understand present and future environmental costs and benefits.

*CSR
corp social
responsibility*

*sustainability
sust*

1.2 Defining environmental costs

There are many varied definitions of environmental costs. The US Environmental Protection Agency make a distinction between four types of cost.

- (a) **Conventional costs** such as raw materials and energy costs that have an impact on the environment.
- (b) **Potentially hidden costs** are relevant costs that are captured within accounting systems but may be 'hidden' within 'general overheads'.
- (c) **Contingent costs** are costs that will be incurred at a future date as a result of discharging waste into the environment such as **clean-up** costs.
- (d) **Image and relationship costs** are costs incurred to preserve the reputation of the business, for example, the costs of preparing environmental reports to ensure compliance with regulatory standards.

1.3 Identifying environmental costs

The majority of environmental costs are already captured within accounting systems. The difficulty lies in **pinpointing** them and **allocating** them to a specific product or service. **Typical environmental costs** are listed below.

- Consumables and raw materials
- Transport and travel
- Waste and effluent disposal
- Water consumption
- Energy

1.4 Controlling environmental costs

Once a business has **defined, identified and allocated** environmental costs, it can begin the task of trying to **control them** through **environmental management systems**.

1.4.1 ISO 14000

ISO 14000 was first published in 1996 and based on earlier quality management standards. It provides a general framework on which a number of specific standards have been based (the ISO family of standards). ISO 14001 prescribes that an environmental management system must comprise:

- An **environmental policy statement**
- An assessment of environmental aspects and legal and voluntary obligations
- A management system
- Internal audits and reports to senior management
- A public declaration that ISO 14001 is being complied with

Critics of ISO 14000 claim that its emphasis on management systems rather than performance is misplaced, and that it does not include rigorous verification and disclosure requirements.

1.4.2 Management systems

In *Accounting for the Environment* Gray and Bebbington listed the functions that environmental management systems should cover.

Function	Description
Environmental review and policy development	A first review of environmental impacts of materials, issues and products and of business issues arising, also the development of a tailored in-house policy or measures to ensure adherence to external standards
Objectives and target development	As with all business objectives and targets, it is preferable that those set be unambiguous and achievable. Targets should be quantified within a specified time period eg reducing carbon dioxide emissions by X% within a specified time period

Function	Description
Life-cycle assessment	This aims to identify all interactions between a product and its environment during its lifetime, including energy and material usage and environmental releases. <ul style="list-style-type: none"> Raw materials used have to be traced back to the biosphere and the company recognise impact on habitat, gas balance, the energy used in the extraction and transportation and the energy used to produce the means of extraction For intermediate stages, emissions, discharges and co-products At the consumer purchase stage, the impact of manufacture and disposal of packaging, transport to shops and ultimately impacts of consumers using and disposing of the product
Establishment and maintenance of environmental management systems	Key features of environmental management systems (as with other management systems) including information systems, budgeting, forecasting and management accounting systems, structure of responsibilities, establishment of an environmentally-friendly culture, considering impact on human resource issues such as education and performance appraisal
Regulatory compliance	Making sure that current legal requirements are being fulfilled and keeping up-to-date with practical implications of likely changes in legislation
Environmental impact assessment	A regular review of interactions with the environment, the degree of impact and also the impact of forthcoming major investments
Eco-label applications	Eco-labelling allows organisations to identify publicly products and services that meet the highest environmental standards. To be awarded an eco-label requires the product to be the result of a reliable quality management system
Waste minimisation	Whether waste can be minimised (or better still eliminated), possibility of recycling or selling waste
Pollution prevention programmes	Deciding what to target
Research, development and investment in cleaner technologies	How to bring desirable features into product development, bearing in mind product development may take several years, and opinion and legal requirements may change during that period. Desirable features may include minimum resource usage, waste, emissions, packaging and transport, recycling, disassembly and longer product life
Environmental performance and issues reporting	Consideration of the benefits and costs of reporting, how to report and what to include (policies, plans, financial data, activities undertaken, sustainability)

2 Accounting for environmental costs

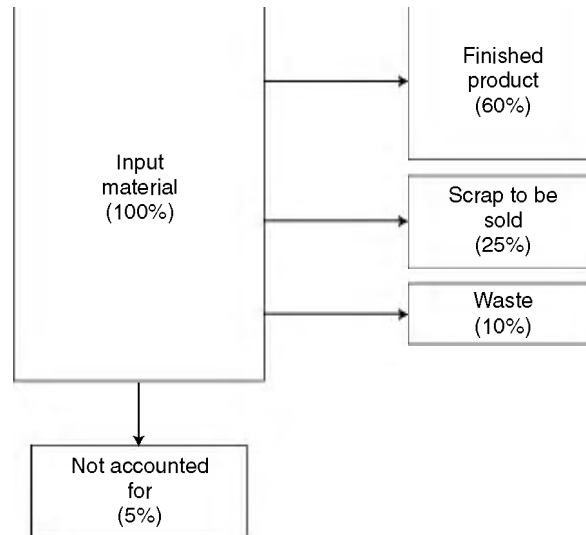
FAST FORWARD

The UNDSO (2003) identified a number of management accounting techniques to account for environmental costs. They are **input/output analysis**, **flow cost accounting**, **environmental activity-based costing** and **life-cycle costing**.

The United Nations Division for Sustainable Development (UNDSO, 2003) identified management accounting techniques which are useful for the identification and allocation of environmental costs. They are **input/output analysis**, **flow cost accounting**, **environmental activity-based accounting** and **life-cycle costing**. ① ② ③ ④

2.1 Input/output analysis

Input/output analysis operates on the principal that what comes in must go out. Process flow charts can help to trace inputs and outputs, in particular waste. They effectively demonstrate the details of the processes so that the relevant information can be allocated to the main activities.



As shown in the diagram above, the input is regarded as 100% and split across the outputs which are **sold and stored goods** and **residual** (regarded as waste).

By accounting for process outputs in this way both in physical quantities and in monetary terms, businesses are forced to focus on environmental costs.

2.2 Flow cost accounting

Under this technique, **material flows** through an organisation are divided into **three categories**.

- **Material**
- **System**
- **Delivery and disposal**

The values and costs of each material flow are then calculated. This method of cost accounting focuses on reducing the quantity of materials which, as well as having a positive effect on the environment, should reduce business' total costs in the long-term.

2.3 Environmental activity-based costing

Activity-based costing (ABC) '...represents a method of managerial cost accounting that allocates all internal costs to the cost centres and cost drivers on the basis of the activities that caused the costs,' (UNSD, 2003).

Under an activity-based system, a distinction is made between **environment-related costs** and **environment-driven costs**. **Environment-related costs** such as costs relating to a sewage plant or incinerator are attributed to **joint environmental cost centres**.

Environment-driven costs such as increased depreciation or a higher cost of staff are allocated to general overheads as they do not relate directly to a joint environmental cost centre.

To decide on the environmental cost drivers, the production processes involved in making a product or providing a service need to be carefully analysed. The **levels** of environmental **hazards** and **costs** need to be **established**. This may mean installing **tracking systems** to track environmental waste.

Schaltegger and Muller (1998) stated 'the choice of an adequate allocation key is crucial for obtaining correct information'. The four main allocations are listed below.

- Volume of emissions or waste
- Toxicity of emissions and waste treated
- Environmental impact added (volume x input per unit of volume)
- The relative costs of treating different kinds of emissions

2.4 Life-cycle costing

Under this method, environmental costs are considered from the **design stage** of a new product right up to the **end-of-life costs** such as decommissioning and removal. This is particularly important in some countries where businesses are held responsible for costs associated with the end of a life of a product.

The consideration of future disposal or remediation costs at the design stage may influence the design of the product itself, saving on future costs.

Chapter Roundup

- **Environmental costs** are important to businesses for a number of reasons.
 - Identifying environmental costs associated with individual products and services can assist with **pricing** decisions.
 - Ensuring compliance with **regulatory standards**.
 - Potential for **cost savings**.
- The UNSD (2003) identified a number of management accounting techniques to account for environmental costs. They are **input/output analysis**, **flow cost accounting**, **environmental activity-based costing** and **life-cycle costing**.

1 What are the main elements of an environmental management system per ISO 14001?

2 *Choose the appropriate words from those highlighted.*

Costs that will be incurred at a future date such as clean up costs are known as **contingent/image and relationship** costs.

Raw materials and energy are examples of **potentially hidden/conventional** costs

3 List the three categories of material flows under a system of flow cost accounting.

- 1
- An environmental policy
 - An assessment of environmental aspects and legal and voluntary obligations
 - A management system
 - Internal audits and reports to senior management
 - A public declaration that ISO 14001 is being complied with
- 2
- contingent
conventional
- 3
- Material
 - System
 - Delivery and disposal

- Kaizen training and manufacturing floor redesign;
- Activity-based accounting;
- A strategic measurement process with a team of 'experts' that moved through each department developing measurement 'levels';
- A senior 'visioning' team to compare the future state with the current situation and do 'interactive planning' to close the gap;
- A 'bureaucracy-busting' team to root out unnecessary forms, meetings, and administration.
- A major information systems project to integrate the order entry and production scheduling systems;
- Socio-technical training in several plants;
- A project to achieve ISO 9000 certification; and
- Personal productivity training for managers based on a recent management 'best seller'.

While many of the programs provided powerful tools, they only produced isolated gains which did not add up to a turnaround of the division. In fact, with so many people engaged in these activities, and feeling overworked by their involvement, a number of senior managers began to believe that the fundamental problem was a lack of resources.

In reality, the division's costs had gotten completely out of hand, and the corporate parent was forced to intervene with the demand for a painful across-the-board expense reduction.

Based on an article in: www.allbusiness.com

1.1 Managing the business, not just the numbers

Although the illustration above reminds us the managing the financial performance of the business remains vitally important, the breadth of the material in this text has also shown that the scope of the management accountant's role is no longer confined to the traditional focus of monitoring divisional activity and financial performance.

A key aspect of this changing role is that management accountants are no longer confined to reporting and controlling costs. Instead, accountants are now much more involved in examining the processes in a firm and looking at ways processes can be improved and costs reduced (for example, through using value chain analysis and benchmarking).

Equally, the management accountant's role is no longer confined to short-term (cost) control. Although short-run costs still need to be controlled, a firm also has to deliver its longer term strategy, and measures such as the balanced scorecard highlight the increasing importance of monitoring the business' performance in terms of its critical business processes.

2 Environmental management accounting

FAST FORWARD

Environmental management accounting (EMA) 'is the generation and analysis of both financial and non-financial information in order to support internal environmental management processes'.

Key term

Environmental management accounting (EMA) 'is the generation and analysis of both financial and non-financial information in order to support internal environmental management processes'.

(Shane Johnson (*former Paper P5 examiner*))

The United Nations Division for Sustainable Development (UNSD) produced a similar definition of environmental management accounting as being the identification, collection, analysis and use of two types of information for internal decision making:

- (a) Physical information on the use, flows and destinies of energy, water and materials (including wastes)
- (b) Monetary information on environment-related costs, earnings and savings.

Environment related costs could be categorised into four groups:

- (a) **Environmental protection costs** – the costs of activities undertaken to prevent the production of waste
- (b) **Environmental detection costs** – costs incurred to ensure that the organisation complies with regulations and voluntary standards
- (c) **Environmental internal failure costs** – costs incurred from performing activities that have produced contaminants and waste that have not been discharged into the environment
- (d) **Environmental external failure costs** – costs incurred on activities performance after discharging waste into the environment.

You may have noticed an overlap here with the 'costs of quality' which we looked at in [Chapter 11](#) earlier in this Study Text. This should come as too much of a surprise, though. In effect, we can consider environmental related costs as being the costs of ensuring the quality of an organisation's processes in relation to the environment.

Exam focus point

You may have noticed some overlap here with the 'costs of quality' which we looked at in Chapter 11 of this Study Text. This should not come as too much of a surprise, though. In effect, we could consider environment related costs as being the costs of ensuring the quality of an organisation's processes in relation to the environment.

Nonetheless, environment related costs are specifically to do with the impact of an organisation's processes on the environment. Therefore, if you have an exam question on environment related costs, make sure you **look specifically at the environmental impact of processes or activities**. For example, an environmental internal failure cost might be the cost of installing filters on a smokestack to reduce the level of carbon dioxide or other gasses emitted into the atmosphere. Equally, an environmental external failure cost might be the cost of cleaning up an oil spill.

If you are asked about environment related costs, do not simply list the generic quality issues (which we covered in Chapter 11.)

2.1 Environmental management accounting – journal articles

Exam focus point

In the January 2004 edition of *Student Accountant*, there was an article by Shane Johnson on 'Environmental Management Accounting.' The main points in the article are summarised below, but you are also strongly advised to read the article in full. It is available on ACCA's website.

The **main points** made in the article are as follows: (The emphasis is BPP's.)

- (a) **Major incidents** like the Exxon Valdez oil spill have significantly **raised the profile of environmental issues** over the last 20 years or so. More recently, the BP Deepwater Horizon oil rig explosion in the Gulf of Mexico (April 2010) also reinforced the importance of environmental issues, and the huge potential costs of environmental disasters.
- (b) Poor environmental behaviour can result in **'fines, increased liability to environmental taxes, loss in value of land, destruction of brand values, loss of sales, consumer boycotts, inability to secure finance, loss of insurance cover, contingent liabilities, law suits, and damage to corporate image'**. In other words, poor environmental behaviour can have a direct impact on a company's financial performance.

Consequently businesses have become increasingly aware of the environmental implications of their operations, products and services, and recognise that managing environmental risks is now an important part of running a successful business.
- (c) Environmental issues need to be **managed before they can be reported** externally, and so changes are needed to management accounting systems.
- (d) Management accounting techniques tend to **underestimate** the cost of poor environmental behaviour, underestimate the benefits of improvements and can **distort and misrepresent**

environmental issues, leading managers to make **decisions that are bad** for business and bad for the environment.

- (e) Most **conventional accounting systems** are unable to apportion **environmental costs** to products, processes and services and so they are simply **classed as general overheads**. 'Consequently, managers are unaware of these costs, have no information with which to manage them and have no incentive to reduce them.' Environmental management accounting (EMA), on the other hand, attempts to make all relevant, significant costs visible so that they can be considered when making business decisions.
- (f) Management accounting techniques which are useful for the identification and management of environmental costs include:
 - (i) **Input/output analysis** ('records material flows with the idea that 'what comes in must go out – or be stored')
 - (ii) **Flow cost accounting** (aims to reduce the quantities of materials, which leads to increased ecological efficiency)
 - (iii) **Environmental Activity-based costing** (distinguishes between environment-related and environment-driven costs)
 - (iv) **Life cycle costing**

Input/output analysis records material flows and balances them with outflows on the basis that what comes in must go out, or be stored. This approach is similar to process costing where all materials in a process are accounted for either as good output or scrap/waste. This forces the business to look at how it uses its resources and focuses it on environmental cost.

So, for example, if 100kg of materials have been bought (input) and only 80kg of materials have been produced (output) then 20kg difference must be accounted for in some way. It may be, for example, that 10% of it has been sold as scrap, leaving 90% as waste. By accounting for outputs in this way, both in terms of physical quantities and, at the end of the process, in monetary terms businesses are forced to focus on environmental costs, and the levels of waste and externalities being generated by their processes.

The difficulty with adopting this technique is putting monetary values on waste, non-accounted materials and scrap if these previously haven't been accounted for. It also requires additional reporting of factors included, such as water use and energy, which may be difficult to attribute to individual units.

Flow cost accounting takes material flows and combines them with the organisational structure. It evaluates material flows in terms of physical quantities, cost and value. Material flows are classified into material, system and delivery and disposal. The values and costs of each of these are then calculated. This system requires additional reporting which may not be available on existing systems and time consuming to accomplish.

Again, though, it may be difficult to attribute costs to all material flows.

Environmental activity-based costing. Traditional activity-based costing allocates all the internal costs of a business to cost centres and cost drivers on the basis of the activities that caused the costs. Environmental activity-based costing distinguishes between environment-related costs and environment-driven costs.

Environment-related costs are costs specifically attributed to joint environmental cost centres, such as a sewage plant, or a waste filtration plant.

By contrast, **Environment-driven costs** are hidden in general overhead costs and do not relate specifically to a joint environmental cost centre, although they do relate to environmental drivers. For example, a company may shorten the working life of a piece of equipment in order to avoid excess pollution in the later years of its working life. As a result, the company's annual depreciation charge will increase. This is an environment-driven cost.

In order for environmental activity-based costing to provide 'correct' information, the choice of allocation basis is crucial. The difficulty in allocating costs correctly could be a major complication in using this method.

Four main bases of allocation are:

- Volume of emissions or waste
- Toxicity of emissions or waste
- Environmental impact added volume of the emissions treated
- The relative costs of treating different kinds of emissions.

Lifecycle costing records the complete costs of a product 'from cradle to grave' taking into account the environmental consequences across the whole life of the product. Organisations need to have the recording systems to capture all costs, especially those incurred **prior to production** (which is when traditional cost recording commences), and **after production ceases** (for example, the costs of cleaning and decontaminating industrial sites when they are decommissioned at the end of a profit).

These costs can often be large sums, and so can have a significant impact on the shareholder value generated by a project. Yet there is a danger that costs which occur after production ceases will be overlooked or given a low priority by managers driven by short-term financial measures. However, it is important that a **project appraisal captures all the costs generated over the whole lifecycle** of the project. Lifecycle costing will help ensure the full extent of this cost information is included.

Moreover, it is also important that potential decommissioning costs and other post-production costs are identified at the start of a project, so that they can be included in the investment appraisal (or similar cost-benefit analysis) to determine whether or not to undertake the project.

- (g) The major areas for the application of EMA are 'in the assessment of **annual environmental costs/expenditures, product pricing, budgeting, investment appraisal, calculating costs and savings of environmental projects, or setting quantified performance targets**'.
- (h) Good environmental management can be seen as a **key component of TQM** (objectives such as zero waste).

In the same way that organisations adopt total quality management to try to reduce defects in production, environmental quality management could be introduced to focus on the 'continuous improvement' of environmental management. Suitable **environmental performance measures or targets** will need to be selected to enable a review of environmental performance to be undertaken. For example, performance targets could include: zero spills, zero pollution, zero waste or zero accidents.

- (i) Although various classifications have been suggested, 'The most significant **problem** of EMA lies in the **absence of a clear definition of environmental costs**. This means that organisations are not monitoring and controlling such costs.'

Exam focus point

There is a second article 'Environmental Management' by Ann Irons, which was published in *Student Accountant* in July 2010. This is also published on ACCA's website, associated to the *F5* Paper, but you are also advised to read this article, because it provides some useful coverage of the issues businesses face in controlling, managing and accounting for environmental costs. However, remember that this article was written for the *F5* paper, and so assumes a lower level of knowledge and application than you would be able expected to demonstrate in *P5*. In this respect, Shane Johnson's article – referred to earlier in the chapter – remains the benchmark for *P5*.

A question in the June 2011 exam asked candidates to evaluate how environmental accounting techniques (including lifecycle costing and input/output analysis) can assist an organisation (an oil refinery) in managing its environmental and strategic performance.

The question then also asked candidates to evaluate how a lifecycle costing approach could affect the forecast profitability of a new product. The key point to note here was the way that traditional product profit analysis overstated profits, because it did not take account of environmental costs and decommissioning costs.

2.2 Environmental concern and performance

Martin Bennett and Peter James (authors of 'The green bottom line: management accounting for environmental improvement and business benefit') looked at the **ways in which a company's concern for the environment can impact on its performance.**

- (a) **Short-term savings** through waste minimisation and energy efficiency schemes can be substantial.
- (b) Companies with poor environmental performance may face **increased cost of capital** because investors and lenders demand a higher risk premium.
- (c) There are a number of **energy and environmental taxes**, such as the UK's landfill tax.
- (d) **Pressure group campaigns** can cause damage to reputation and/or additional costs.
- (e) Environmental legislation may cause the **'sunsetting'** of products and opportunities for **'sunrise' replacements.**
- (f) The cost of processing input which becomes **waste** is equivalent to 5-10% of some organisation's revenue.
- (g) The **phasing out of CFCs** has led to markets for alternative products.

2.2.1 Achieving business and environmental benefits

Bennett and James went on to suggest six main **ways in which business and environmental benefits can be achieved.**

- (a) **Integrating the environment into capital expenditure decisions** (by considering environmental opposition to projects which could affect cash flows, for example). There is a feeling that most companies do not know about the extent of their environmental costs, and so tend to underestimate them. This can lead to distorted calculations in investment decisions.
- (b) **Understanding and managing environmental costs.** Environmental costs are often 'hidden' in overheads and environmental and energy costs are often not allocated to the relevant budgets.
- (c) **Introducing waste minimisation schemes**
- (d) **Understanding and managing life cycle costs.** For many products, the greatest environmental impact occurs upstream (such as mining raw materials) or downstream from production (such as energy to operate equipment). This has led to producers being made responsible for dealing with the disposal of products such as cars, and government and third party measures to influence raw material choices. Organisations therefore need to identify, control and make provision for environmental life cycle costs and work with suppliers and customers to identify environmental cost reduction opportunities.
- (e) **Measuring environmental performance.** Business is under increasing pressure to measure all aspects of environmental performance, both for statutory disclosure reasons and due to demands for more environmental data from customers.
- (f) **Involving management accountants in a strategic approach to environment-related management accounting and performance evaluation.** A 'green accounting team' incorporating the key functions should analyse the strategic picture and identify opportunities for practical initiatives. It should analyse the short-, medium- and long-term impact of possible changes in the following:

- (i) **Government policies**, such as on transport
- (ii) **Legislation and regulation**
- (iii) **Supply conditions**, such as fewer landfill sites
- (iv) **Market conditions**, such as changing customer views
- (v) **Social attitudes**, such as to factory farming
- (vi) **Competitor strategies**

Possible action includes the following.

- (i) Designating an '**environmental champion**' within the strategic planning or accounting function to ensure that environmental considerations are fully considered.
- (ii) Assessing whether **new data sources** are needed to collect more and better data
- (iii) Making **comparisons** between sites/offices to highlight poor performance and generate peer pressure for action
- (iv) Developing **checklists** for internal auditors

Such analysis and action should help organisations to better understand present and future environmental costs and benefits.

3 Benchmarking and public sector league tables

We considered benchmarking in [Chapters 1](#) and [6](#) when we looked at its use for setting targets by comparing with outside organisations. It is a **tool for external comparison**. Public sector organisations use benchmarking to make comparisons with similar not-for-profit organisations as well as private sector organisations.

Benchmarking can have a **positive affect on behaviour**. By sharing data on performance against appropriate benchmarks, organisations can improve their own performance. This is co-operative benchmarking. It encourages management to concentrate on what is important based on the benchmarked measures in league tables and set strategies based on attaining these. Operational targets should then be set to achieve the benchmarked measure(s).

However, whilst benchmarking can have a positive impact on behaviour it could also have less favourable consequences. An organisation has to be selective in what aspects of performance to benchmark, but there is a danger they may focus on areas that are easy to measure rather than being critical business processes. In a similar vein, benchmarking may allow a business to carry out a process more **efficiently**, but if the output of that process is not very important then the **effectiveness** of the improvement is limited. In effect, there is a danger that benchmarking can concentrate on 'doing things right' rather than 'doing the right thing.'

Management may also concentrate on achieving specific benchmarks whilst neglecting others. For **example**, in the UK, **university league tables** are produced based on nine selected aspects of the universities' performance:

- **Student satisfaction** - measure of the view of students of the teaching quality at the university
- **Research assessment/quality** - measure of the average quality of the research undertaken in the university
- **Entry standards** - the average exam grades in their final school exams ('A' levels) that students have to achieve to secure their place
- **Student:staff ratio** - measure of the average staffing level in the university
- **Academic Services spend** - the expenditure per student on all academic services
- **Facilities spend** - the expenditure per student on staff and student facilities
- **Good honours** - proportion of first and upper-second class degrees
- **Graduate prospects** - measure of the employability of a university's
- **Completion** - measure of the completion rate of those studying at the university



Think Ahead

Menu 

Environmental management accounting

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A member of the Performance Management examining team provides students with an introduction to environmental management accounting

The two requirements of the Performance Management syllabus are as follows:

- discuss the issues businesses face in the management of environmental costs.
- describe the different methods a business may use to account for its environmental costs.

You should note that the Performance Management syllabus examines 'environmental management accounting' rather than 'environmental accounting'. Environmental accounting is a broader term that encompasses the provision of environment-related information both externally and internally. It focuses on reports required for shareholders and other stakeholders, as well of the

provision of management information. Environmental management accounting, on the other hand, is a subset of environmental accounting. It focuses on information required for decision making within the organisation, although much of the information it generates could also be used for external reporting.

The aim of this article is to give a general introduction on the area of environmental management accounting, followed by a discussion of the first of the two requirements listed above.

Many of you reading this article still won't be entirely clear on what environmental management accounting actually is. You will not be alone! There is no single textbook definition for it, although there are many long-winded, jargon ridden ones available. Before we get into the unavoidable jargon, the easiest way to approach it in the first place is to step back and ask ourselves what management accounting itself is. Management accounts give us an analysis of the performance of a business and are ideally prepared on a timely basis so that we get up-to-date management information. They break down each of our different business segments (in a larger business) in a high level of detail. This information is then used to assess how the business' historic performance has been and, moving forward, how it can be improved in the future.

Environmental management accounting is simply a specialised part of the management accounts that focuses on things such as the cost of energy and water and the disposal of waste and effluent. It is important to note at this point that the focus of environmental management accounting is not all on purely financial costs. It includes consideration of matters such as the costs vs benefits of buying from suppliers who are more environmentally aware, or the effect on the public image of the company from failure to comply with environmental regulations.

Environmental management accounting uses some standard accountancy techniques to identify, analyse, manage and hopefully reduce environmental costs in a way that provides mutual benefit to the company and the environment, although sometimes it is only possible to provide benefit to one of these parties.

Example:

Activity-based costing may be used to ascertain more accurately the costs of washing towels at a gym. The energy used to power the washing machine is an environmental cost; the cost driver is 'washing'.

Once the costs have been identified and information accumulated on how many customers are using the gym, it may actually be established that some customers are using more than one towel on a single visit to the gym. The gym could drive forward change by informing customers that they need to pay for a second towel if they need one. Given that this approach will be seen as 'environmentally-friendly', most customers would not argue with its introduction. Nor would most of them want to pay for the cost of a second towel. The costs to be saved by the company from this new policy would include both the energy savings from having to run fewer washing machines all the time and the staff costs of those people collecting the towels and operating the machines. Presumably, since the towels are being washed less frequently, they will need to be replaced by new ones less often as well.

In addition to these savings to the company, however, are the all-important savings to the environment since less power and cotton (or whatever materials the towels are made from) is now being used, and the scarce resources of our planet are therefore being conserved. Lastly, the gym is also seen as an environmentally friendly organisation and this, in turn, may attract more customers and increase revenues. Just a little bit of management accounting (and common sense!) can achieve all these things. While I always like to minimise the use of jargon, in order to be fully versed on what environmental management accounting is really seen by the profession as encompassing today, it is necessary to consider a couple of the most widely accepted definitions of it.

In 1998, the International Federation of Accountants (IFAC) originally defined environmental management accounting as:

'The management of environmental and economic performance, through the development and implementation of appropriate environment-related accounting systems and practices. While this may include reporting and auditing in some companies, environmental management accounting typically involves lifecycle costing, full cost accounting, benefits assessment, and strategic planning for environmental management.'

Then, in 2001, The United Nations Division for Sustainable Development (UNSD) emphasised their belief that environmental management accounting systems generate information for internal decision making rather than external decision making. This is in line with my statement at the beginning of this article that EMA is a subset of environmental accounting as a whole.

The UNSD make what became a widely accepted distinction between two types of information: physical information and monetary information. Hence, they broadly defined EMA to be the identification, collection, analysis and use of two types of information for internal decision making:

- physical information on the use, flows and destinies of energy, water and materials (including wastes)
- monetary information on environment-related costs, earnings and savings.

This definition was then adopted by an international consensus group of over 30 nations and thus eventually adopted by IFAC in its 2005 international guidance document on 'environmental management accounting'.

To summarise then, for the purposes of clarifying the coverage of the Performance Management syllabus, my belief is that EMA is internally not externally focused and the Performance Management syllabus should, therefore, focus on information for internal decision making only. It should not be concerned with how environmental information is reported to stakeholders, although it could include consideration of how such information could be reported internally. For example, Hansen and Mendoza (1999) stated that environmental costs are incurred because of poor quality controls. Therefore, they advocate the use of a periodical environmental cost report that is produced in the format of a cost of quality report, with each category of cost being expressed as a percentage of sales revenues or operating costs so that comparisons can be made between different periods and/or organisations. The categories of costs would be as follows:

- Environmental prevention costs: the costs of activities undertaken to prevent the production of waste.
- Environmental detection costs: costs incurred to ensure that the organisation complies with regulations and voluntary standards.
- Environmental internal failure costs: costs incurred from performing activities that have produced contaminants and waste that have not been discharged into the environment.
- Environmental external failure costs: costs incurred on activities performed after discharging waste into the environment.

It is clear from the suggested format of this quality type report that Hansen and Mendoza's definition of 'environmental cost' is relatively narrow.

Managing environmental costs

There are **three main reasons why the management of environmental costs is becoming increasingly important** in organisations.

First, society as a whole has become more environmentally aware, with people becoming increasingly aware about the 'carbon footprint' and recycling taking place now in many countries. A 'carbon footprint' (as defined by the Carbon Trust) measures the total greenhouse gas emissions caused directly and indirectly by a person, organisation, event or product. Companies are finding that they can increase their appeal to customers by portraying themselves as environmentally responsible.

Second, environmental costs are becoming huge for some companies, particularly those operating in highly industrialised sectors such as oil production. In some cases, these costs can amount to more than 20% of operating costs. Such significant costs need to be managed.

Third, regulation is increasing worldwide at a rapid pace, with penalties for non-compliance also increasing accordingly. In the largest ever seizure related to an environmental conviction in the UK, a plant hire firm, John Craxford Plant Hire Ltd, had to not only pay £85,000 in costs and fines but also got £1.2m of its assets seized. This was because it had illegally buried waste and also breached its waste and pollution permits. And it's not just the companies that need to worry. Officers of the company and even junior employees could find themselves facing criminal prosecution for knowingly breaching environmental regulations.

But the management of environmental costs can be a difficult process. This is because first, just as EMA is difficult to define, so too are the actual costs involved. Second, having defined them, some of the costs are difficult to separate out and identify. Third, the costs can need to be controlled but this can only be done if they have been correctly identified in the first place. Each of these issues is dealt with in turn below.

Defining environmental costs

Many organisations vary in their definition of environmental costs. It is neither possible nor desirable to consider all of the great range of definitions adopted. A useful cost categorisation, however, is that provided by the US Environmental Protection Agency in 1998. They stated that the definition of environmental costs depended on how an organisation intended on using the information. They made a distinction between **four types of costs**:

- **conventional costs**: raw material and energy costs having environmental relevance
- **potentially hidden costs**: costs captured by accounting systems but then losing their identity in 'general overheads'
- **contingent costs**: costs to be incurred at a future date – for example, clean up costs
- **image and relationship costs**: costs that, by their nature, are intangible, for example, the costs of preparing environmental reports.

The UNDSO, on the other hand, described environmental costs as comprising of:

- costs incurred to protect the environment – for example, measures taken to prevent pollution, and
- costs of wasted material, capital and labour, ie inefficiencies in the production process.

Neither of these definitions contradict each other; they just look at the costs from slightly different angles. As a Performance Management student, you should be aware that definitions of environmental costs vary greatly, with some being very narrow and some being far wider.

Identifying environmental costs

Much of the information that is needed to prepare environmental management accounts could actually be found in a business' general ledger. A close review of it should reveal the costs of materials, utilities and waste disposal, at the least. The main problem is, however, that most of the costs will have to be found within the category of 'general overheads' if they are to be accurately identified. Identifying them could be a lengthy process, particularly in a large organisation. The fact that environmental costs are often 'hidden' in this way makes it difficult for management to identify opportunities to cut environmental costs and yet it is crucial that they do so in a world which is becoming increasingly regulated and where scarce resources are becoming scarcer.

It is equally important to allocate environmental costs to the processes or products which give rise to them. Only by doing this can an organisation make well-informed business decisions. For example, a pharmaceutical company may be deciding whether to continue with the production of one of its drugs. In order to incorporate environmental aspects into its decision, it needs to know exactly how many products are input into the process compared to its outputs; how much waste is created during the process; how much labour and fuel is used in making the drug; how much packaging the drug uses and what percentage of that is recyclable etc. Only by identifying these costs and allocating them to the product can an informed decision be made about the environmental effects of continued production.

In 2003, the UNDSO identified four management accounting techniques for the identification and allocation of environmental costs: input/outflow analysis, flow cost accounting, activity based costing and lifecycle costing. These are referred to later under 'different methods of accounting for environmental costs'.

Controlling environmental costs

It is only after environmental costs have been defined, identified and allocated that a business can begin the task of trying to control them.

As we have already discussed, environmental costs will vary greatly from business to business and, to be honest, a lot of the environmental costs that a large, highly industrialised business will incur will be difficult for the average person to understand, since that person won't have a detailed knowledge of the industry concerned.

I will therefore use some basic examples of easy-to-understand environmental costs when considering how an organisation may go about controlling such costs. Let us consider an organisation whose main environmental costs are as follows:

- waste and effluent disposal
- water consumption
- energy
- transport and travel
- consumables and raw materials.

Each of these costs is considered in turn below.

Waste

There are lots of environmental costs associated with waste. For example, the costs of unused raw materials and disposal; taxes for landfill; fines for compliance failures such as pollution. It is possible to identify how much material is wasted in production by using the 'mass balance' approach, whereby the weight of materials bought is compared to the product yield. From this process, potential cost savings may be identified. In addition to these monetary costs to the organisation, waste has environmental costs in terms of lost land resources (because waste has been buried) and the generation of greenhouse gases in the form of methane.

Water

You have probably never thought about it but businesses actually pay for water twice – first, to buy it and second, to dispose of it. If savings are to be made in terms of reduced water bills, it is important for organisations to identify where water is used and how consumption can be decreased.

Energy

Often, energy costs can be reduced significantly at very little cost. Environmental management accounts may help to identify inefficiencies and wasteful practices and, therefore, opportunities for cost savings.

Transport and travel

Again, environmental management accounting can often help to identify savings in terms of business travel and transport of goods and materials. At a simple level, a business can invest in more fuel-efficient vehicles, for example.

Consumables and raw materials

These costs are usually easy to identify and discussions with senior managers may help to identify where savings can be made. For example, toner cartridges for printers could be refilled rather than replaced.

This should produce a saving both in terms of the financial cost for the organisation and a waste saving for the environment (toner cartridges are difficult to dispose of and less waste is created this way).

Accounting for environmental costs

In the context of Performance Management, when the syllabus requires you to describe the different methods of accounting for environmental costs, it aims to cover two areas:

- **Internal reporting of environmental costs**, which has already been discussed in the introduction.
- **Management accounting techniques for the identification and allocation of environmental costs**: the most appropriate ones for the Performance Management syllabus are those identified by the UNDSO, namely input/outflow analysis, flow cost accounting, activity-based costing and lifecycle costing.

Input/outflow analysis

This technique records material inflows and balances this with outflows on the basis that, what comes in, must go out. So, if 100kg of materials have been bought and only 80kg of materials have been produced, for example, then the 20kg difference must be accounted for in some way. It may be, for example, that 10% of it has been sold as scrap and 90% of it is waste. By accounting for outputs in this way, both in terms of physical quantities and, at the end of the process, in monetary terms too, businesses are forced to focus on environmental costs.

Flow cost accounting

This technique uses not only material flows but also the organisational structure. It makes material flows transparent by looking at the physical quantities involved, their costs and their value. It divides the material flows into three categories: material, system and delivery and disposal. The values and costs of each of these three flows are then calculated. The aim of flow cost accounting is to reduce the quantity of materials which, as well as having a positive effect on the environment, should have a positive effect on a business' total costs in the long run.

Activity-based costing

ABC allocates internal costs to cost centres and cost drivers on the basis of the activities that give rise to the costs. In an environmental accounting context, it distinguishes between environment-related costs, which can be attributed to joint cost centres, and environment-driven costs, which tend to be hidden on general overheads.

Lifecycle costing

Within the context of environmental accounting, lifecycle costing is a technique which requires the full environmental consequences, and, therefore, costs, arising from production of a product to be taken account across its whole lifecycle, literally 'from cradle to grave'.

Summary

I hope you now have a clearer idea about exactly what environmental management accounting is and why it's important. While I have tried to give some simple, practical examples and explanations, a certain amount of jargon is unavoidable in this subject area. Enjoy your further reading.

Written by a member of the Performance Management examining team



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This article is intended to help students understand environmental management accounting, its increasing importance, and new developments.

The global profile of environmental issues has risen significantly during the past two decades, precipitated in part by major incidents such as the Bhopal chemical leak (1984) and the Exxon Valdez oil spill (1989). These events received worldwide media attention and increased concerns over major issues such as global warming, depletion of non-renewable resources, and loss of natural habitats.

This has led to a general questioning of business practices and numerous calls for change. These questions have not only been raised by organisations such as Friends of the Earth, Greenpeace, or groups of 'eco-warriors', but from the United Nations, the European Union, the UK government, the British Bankers Association, insurance companies and pension funds. Recognition that our current way of life poses a threat to us and our planet, has led to global agreements on action to prevent future environmental damage. Such agreements include the Montreal Protocol, the Rio Declaration, and the Kyoto Protocol.

Businesses have become increasingly aware of the environmental implications of their operations, products and services. Environmental risks cannot be ignored, they are now as much a part of running a successful business as product design, marketing, and sound financial management. Poor environmental behaviour may have a real adverse impact on the business and its finances. Punishment includes fines, increased liability to environmental taxes, loss in value of land, destruction of brand values, loss of sales, consumer boycotts, inability to secure finance, loss of insurance cover, contingent liabilities, law suits, and damage to corporate image.

Nearly all aspects of business are affected by environmental pressures, including accounting. From an accounting perspective, the initial pressures were felt in external reporting, including environmental disclosures in financial reports and/or the production of separate environmental accounts. Much has been written about the nature and quality of these accounts (see Gray and Bebbington, 2001 for an introduction into this area). However, environmental issues cannot be dealt with solely through external reporting. Environmental issues need to be managed before they can be reported on, and this requires changes to management accounting systems.

Environmental review of conventional management accounting

In an ideal world, organisations would reflect environmental factors in their accounting processes via the identification of the environmental costs attached to products, processes, and services. Nevertheless, many existing conventional accounting systems are unable to deal adequately with environmental costs and as a result simply attribute them to general overhead accounts. Consequently, managers are unaware of these costs, have no information with which to manage them and have no incentive to reduce them (United Nations Division for Sustainable Development (UNSD), 2003). It must be recognised that most management accounting techniques significantly underestimate the cost of poor environmental behaviour. Many overestimate the cost and underestimate the benefits of improving environmental practices.

Management accounting techniques can distort and misrepresent environmental issues, leading to managers making decisions that are bad for businesses and bad for the environment. The most obvious example relates to energy usage. A recent UK government publicity campaign reports that companies are spending, on average, 30% too much on energy through inefficient practices. With good energy management, we could reduce the environmental impact of energy production by 30% and slash 30% of organisations' energy expenditure. Frost and Wilmhurst (2000) suggest that by failing to reform management accounting practices to incorporate environmental concerns, organisations are unaware of the impact on profit and loss accounts and the balance sheet impact of environment-related activities. Moreover, they miss out on identifying cost reduction and other improvement opportunities; employ incorrect product/service pricing, mix and development decisions. This leads to a failure to enhance customer value, while increasing the risk profile of investments and other decisions with long-term consequences. If management accounting as a discipline is to contribute to improving the environmental performance of organisations, then it has to change. Environmental Management Accounting (EMA) is an attempt to integrate best management accounting thinking and practice with best environmental management thinking and practice.

Environmental management accounting

EMA is the generation and analysis of both financial and non-financial information in order to support internal environmental management processes. It is complementary to the conventional financial management accounting approach, with the aim to develop appropriate mechanisms that assist in the identification and allocation of environment-related costs (Bennett and James (1998a), Frost and Wilmhurst (2000)). The major areas for the application for EMA are:

- product pricing
- budgeting
- investment appraisal
- calculating costs, and
- savings of environmental projects, or setting quantified performance targets.

EMA is as wide-ranging in its scope, techniques and focus as normal management accounting. Burritt et al (2001) stated: 'there is still no precision in the terminology associated with EMA'. They viewed EMA as being an application of conventional accounting that is concerned with the environmentally-induced impacts of companies, measured in monetary units, and company-related impacts on environmental systems, expressed in physical units. EMA can be viewed as a part of the environmental accounting framework and is defined as 'using monetary and physical information for internal management use'.

Burritt et al developed a multi-dimensional framework of EMA. Their framework considers the distinctions between five dimensions:

- internal versus external
- physical versus monetary classifications
- past and future timeframes
- short and long terms, and
- ad hoc versus routine information gathering in the proposed framework for the application of EMA.

Within this framework the different techniques of EMA – such as environmental lifecycle costing or environmental cost accounting – can be placed and assigned. The management of a company can choose appropriate tools on the basis of their information needs.

Similarly, in a series of publications (1997, 1998a, 1998b), Bennett and James describe the diverse range and scope of environmental management accounting. They provide a set of useful models, one of which is 'The Environment-Related Management Accounting Pyramid', to help evaluate environmental management accounting practices as well as to help in the design and implementation of new systems.

According to Bennett and James (1998a), EMA is concerned with gathering data related to the environment (lowest levels), which are converted through techniques and processes (middle level) into information which is useful for managers (top). Key data is both non-financial and financial in nature. Management accounting techniques such as performance measurement, operational budgeting, costing or pricing are used for the transformation.

Examples of techniques

Defining environmental costs

A literature review reveals various approaches to the definition of environmental costs. In 1998, the US Environmental Protection Agency argued that the definition of environmental costs depended on how a company intends to use the information, for example in capital budgeting or product design. They made a distinction between four types of costs:

- Conventional costs are those raw material and energy costs having environmental relevance.
- Potentially hidden costs are those which are captured by accounting systems, but then lose their identity in 'overheads'.
- Contingent costs may be incurred at a future date – for example, costs for cleaning up. They are also referred to as contingent liabilities.
- Image and relationship costs are intangible in nature and include, for example, the costs of producing environmental reports.

However, such costs pale into insignificance when compared with the costs associated with being seen to behave in an irresponsible manner. The infamous Brent Spar incident that cost the Shell oil company millions of pounds in terms of lost revenues via the resultant consumer boycott is an example of the powerful influence that environmental concern has in today's business environment. Shell learned the lesson, albeit somewhat belatedly, and as a result completely re-engineered its environmental management system.

ACCA has also published a research report outlining an agenda for action on full cost accounting (Bebbington, Gray, Hibbit and Kirk, 2001), which contains a detailed review of the business case for adopting full environmental costing. One example of the potential gains from using full costing (sometimes referred to as lifecycle costing, Bennett and James (1998b)) can be seen in the case of Xerox limited.

Xerox limited, a subsidiary of Xerox Corporation, introduced the concept of lifecycle costing for its logistic chain. The core business of Xerox limited is manufacturing photocopiers, which are leased rather than sold. This means the machines are returned to Xerox limited at the end of their lease. Previously, machines were shipped in a range of different types of packaging, which could rarely be re-used by customers to return the old copiers. The customer had to dispose of the original packaging and to provide new packaging to return the machine at the end of its lease, which in turn could not be used to re-ship other machines. This meant Xerox lost the original costs and had to bear the costs of disposal of the packaging.

A new system was invented which used a standard pack (tote). Two types of totes were introduced to suit the entire range of products sold by Xerox. Totes can be used for both new machines delivery and return carcasses. The whole-chain cost analysis showed the considerably lower cost of the tote system, compared to the previously existing system and the supply chain became more visible. The tote system resulted not only in cost savings but also in reduced 'de-pack' times and improved customer relations (Bennett and James, 1998b).

UNSD (2003) described total corporate environmental costs as environmental protection costs (emission treatment and pollution prevention) plus costs of wasted materials, plus costs of wasted capital and labour. Waste in this context means production inefficiency (purchase value of non-material output). UNSD stated that wasted materials account for 40% to 90% of environmental costs according to a survey. One should recognise that environmental costs are not a separate type of cost; rather they are part of money flowing throughout a corporation.

The main difficulty associated with environmental costs is their identification and allocation. According to UNSD (2003), conventional accounting systems tend to attribute many of the environmental costs to general overhead accounts with the result

that they are 'hidden' from management. Thus, management is often unaware of the extent of environmental costs and cannot identify opportunities for cost savings. EMA attempts to make all relevant, significant costs visible so that they can be considered when making business decisions (Jasch, 2003). UNDSO (2003) identified management accounting techniques which are useful for the identification and allocation of environmental costs as: input/output analysis, flow cost accounting, activity-based costing (ABC), and life-cycle costing. The two techniques specifically mentioned in the APM syllabus are activity-based costing and life-cycle costing.

Environmental activity-based accounting

Activity-based costing (ABC) '...represents a method of managerial cost accounting that allocates all internal costs to the cost centres and cost drivers on the basis of the activities that caused the costs,' (UNDSO, 2003). ABC applied to environmental costs distinguishes between environment-related costs and environment-driven costs. The former are attributed to joint environmental cost centres, for example incinerators or sewage plants. The latter are hidden in the general overheads and do not relate directly to a joint environmental cost centre – eg increased depreciation or higher cost of staff. Nevertheless they vary with the amount of throughput.

Schaltegger and Muller (1998) stated 'the choice of an adequate allocation key is crucial for obtaining correct information'. The four main allocation keys are:

- volume of emissions or waste
- toxicity of emission and waste treated
- environmental impact added (volume x input per unit of volume) volume of the emissions treated, and
- the relative costs of treating different kinds of emissions.

Life-cycle costing

Within the context of environmental accounting, life-cycle costing is a technique which requires the full environmental consequences, and, therefore, costs, arising from production of a product to be taken account across its whole lifecycle, literally 'from cradle to grave'. It summarises all the costs associated with the lifecycle of a product regardless of who bears those costs. This method connects the conventional approach to life-cycle costing to also including environmental and social costs.

Environmental management as part of total quality management

The pursuit of environmental quality management via the development of an Environmental Management System (EMS) can only be achieved if 'environmental audit' is a concomitant feature of such a system. In this respect the organisation becomes self-regulating and the undertaking of environmental audits on a regular basis provides the platform for organisations to adopt a self-critical and analytical posture as part of their routine organisational management processes. Organisations should be striving to achieve an integrated environmental strategy underpinned by the same type of culture that is required for the successful operation of a programme of total quality management (TQM).

It is arguable that the two are inextricably linked insofar as good environmental management is increasingly recognised as an essential component of TQM. In common with TQM, the focus is upon 'continuous improvement' and the pursuit of excellence. Such organisations pursue objectives that may include zero complaints, zero spills, zero pollution, zero waste and zero accidents. Information systems need to be able to support such environmental objectives via the provision of feedback – on the success or otherwise – of the organisational efforts in achieving such objectives. This approach to environmental quality management requires the development of environmental performance measures and indicators that will enable a comprehensive

review of environmental performance to be undertaken. Many - if not all - total quality management accounting techniques can be modified and effectively adopted to help manage environmental issues.

Conclusion

It can be said that most companies do not know about the extent of their environmental costs and tend to underestimate them. This leads to distorted calculations of improvement options. For example, Amoco Yorktown Refinery estimated their environmental costs at 3% of non-crude operational costs. Actually they comprised 22% of non-crude operating costs as the case study of Ditz et al (1998) revealed. However, the study also discovered a large proportion of environmental costs were caused by other processes that had not been identified by Amoco.

EMA can solve these problems. The above-mentioned accounting techniques are useful for EMA to identify and allocate environmental costs. In addition, there are alternative techniques to estimate environmental costs such as the 'environmental cost decision tree' as described by Rimer (2000).

The most significant problem of EMA lies in the absence of a clear definition of environmental costs. This means it is likely that organisations are not monitoring and reporting such costs. The increase in environmental costs is likely to continue, which will result in the increased information needs of managers and provide the stimulus for the agreement of a clear definition. If a generally applicable meaning of environmental costs is established, the use of EMA will probably increase with positive effects for both organisations and the environment in which they operate. In the future it will not only be large companies which can afford to implement EMA but also small and medium-sized enterprises which have fewer available financial resources.

References:

- Bebbington, J, Gray, R, Hibbitt, C and Kirk, E Full Costs Accounting: An Agenda for Action (ACCA Research Report No. 73, Certified Accountants Educational Trust, London, 2001)
- Bennett, M and James, P Environment-Related Management Accounting Current Practice and Future Trends, Greener Management International, Spring 97 (No.17, pp32-41, Business Source Premier, 1997)
- Bennett, M and James, P The Green Bottom line, in: Bennett, M and James, P (Eds) The Green Bottom line – Environmental Accounting for Management: Current Practice and Future Trends (Greenleaf Publishing, Sheffield, 1998a)
- Bennett, M and James, P life Cycle Costing and Packaging at Xerox Ltd, in: Bennett, M and James, P (Eds) The Green Bottom line – Environmental Accounting for Management: Current Practice and Future Trends (Greenleaf Publishing, Sheffield, 1998b)
- Burritt, L, Hahn, T and Schaltegger, S Current Developments in Environmental Management Accounting – Towards a Comprehensive Framework for Environmental Management Accounting (EMA) (Universitaet Lueneburg, 2001).
- Ditz, D, Ranganathan, J and Banks, R D Green Ledgers – An Overview, in: Bennett, M and James, P (Eds) The Green Bottom line – Environmental Accounting for Management: Current Practice and Future Trends (Greenleaf Publishing, Sheffield, 1998)
- Envirowise Increase your profits with environmental management accounting, (Envirowise – Practical environmental advice for businesses, 2003, last update)
- Frost, G R and Wilmshurst, T D The adoption of environment-related management accounting: an analysis of corporate environmental sensitivity (Accounting Forum Vol 24, No 4, pp 344-365, Business Source Premier, 2000)
- Gray, R and Bebbington J Accounting for the Environment (2nd edition) (Sage Publications Ltd, 2001)
- Jasch, C The use of Environmental Management Accounting (EMA) for identifying environmental costs, Journal of Cleaner Production

- Rimer, A E Identifying, Reducing and Controlling Environmental Costs, Plant Engineering (Vol 54, No 3, pp114-118, Business Source Premier, 2000)
- UNDSO – United Nations Division for Sustainable Development, Environmental Management Accounting Procedures and Principles (EMARIC Environmental Management Accounting Research and Information Center, 2003)

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