Question

Stakeholder commitment

Think of some examples of how what organisations might want from employees, suppliers and regulators.

Answer

Employees. Their time, their skills and their motivation. Possibly also flexibility to adapt to new roles of to changes in the organisation.

Suppliers. Timely delivery, of the correct order, and to the right place.

Regulators. Efficient working relationships and the lack of excessive bureaucracy. Good understanding of the business sector and the pressures companies in it face.

Neely and Adams remark that the notion of stakeholder contribution is a vital one, because it explains why there is so much confusion around the concept of stakeholders in the literature.

They suggest that organisations need to get a clear understanding of the 'dynamic tension' that exists between what stakeholders want and need from the organisation, and what the organisation wants and needs from its stakeholders.

4.2 Strengths and weaknesses of the performance prism

The performance prism has a far wider view of stakeholders than the other models in this chapter. It includes a range of stakeholders and considers their wants and needs before setting strategies therefore this model does not derive performance measures solely from internally-derived strategy. In this respect it has a good foundation in the actual strategies that should be adopted based on the organisation's stakeholders.

However, unlike many of the other models we have looked at, it doesn't go into detail on what performance measures should be used for each perspective.

5 Activity-based management

FAST FORWARD

Activity-based management (**ABM**) includes performing activities more efficiently, eliminating the need to perform certain activities that do not add value for customers, improving the design of products and developing better relationships with customers and suppliers. The goal of ABM is to enable customer needs to be satisfied while making fewer demands on organisational resources.

Exam focus point

Note the potential links between activity-based management and Porter's Value Chain which we looked at in Chapter 3 earlier in this Study Text.

Activity-based management encourages managers to view businesses as a set of linked activities which add value for a customer. This then encourages managers to eliminate unnecessary activities (and thereby reduce costs) and improve the performance of value-adding activities and processes.

The idea of process improvement also links back to the ideas of continuous improvement and Six Sigma which we discussed in Chapter 11, and possibly, if more radical improvements are required, to Business Process Re-engineering (which we discussed in Chapter 3).

5.1 Definitions of activity-based management

Activity-based costing (ABC) was originally introduced as a method of working out the cost of producing a product. However, organisations can now also use ABC information to help manage costs, and to focus on those activities which add value.

In essence, the emphasis has switched away from using activity-based approaches for product costing to using it to **improve cost management**. The terms activity-based management (ABM) and activity-based cost management (ABCM) are used to describe the cost management applications of ABC. In effect, ABM is ABC in action.

There are a great many different definitions of activity-based management.

Here is Drury's definition (from *Management and Cost Accounting*), with BPP's emphasis.

> 'ABM views the business as a set of linked activities that ultimately add value to the customer. It focuses on managing the business on the basis of the activities that make up the organisation. ABM is based on the premise that activities consume costs. Therefore **by managing activities costs will be managed in the long term**. The **goal of ABM is to enable customer needs to be satisfied while making fewer demands on organisation resources**. The measurement of activities is a key role of the management accounting function. In particular, activity cost information is useful for prioritising those activities that need to be studied closely so that they can be eliminated or improved.
>
> In recent years ABM information has been used for a variety of business applications. They include cost reduction, activity-based budgeting, performance measurement, benchmarking and business process re-engineering.'

Horngren, Foster and Datar in *Cost Accounting: A Managerial Emphasis* 'define it broadly to include pricing and product-mix decisions, cost reduction and process improvement decisions, and product design decisions'.

In *Managerial Accounting,* Raiborn, Barfield and Kinney include **activity analysis**, **cost driver analysis**, **continuous improvement**, **operational control and performance evaluation** as the concepts covered by activity based management. 'These concepts help companies to produce more efficiently, determine costs more accurately, and control and evaluate performance more effectively.'

Clark and Baxter (*Management Accounting,* June 1992) provide a description, which appears to include every management accounting buzzword.

> 'The aim of activity-based management (ABM) is to provide management with a method of introducing and managing 'process and organisational change.'

It focuses on activities within a process, decision-making and planning relative to those activities and the need for continuous improvement of all organisational activity. Management and staff must determine which activities are critical to success and decide how these are to be clearly defined across all functions.

Everyone must co-operate in defining:

(a) Cost pools
(b) Cost drivers
(c) Key performance indicators

They must be trained and empowered to act; all must be fairly treated and success recognised.

Clearly, ABM and employee empowerment take a critical step forward beyond ABC by recognising the contribution that people make as the key resource in any organisation's success.

(a) It nurtures good communication and team work
(b) It develops quality decision-making
(c) It leads to quality control and continuous improvement

Some accountants do not appear to understand that ABM provides an essential link to total quality management (TQM) and its concepts of 'continuous improvement'.

ABM helps deliver:

(a) Improved quality
(b) Increased customer satisfaction
(c) Lower costs
(d) Increased profitability

> 'It provides accountants and other technical managers with a meaningful path into the business management team.'

Perhaps the clearest and most concise definition of ABM, however, is offered by Kaplan *et al* in *Management Accounting.*

Key term

> **Activity based management (ABM)** is '…the management processes that use the information provided by an activity-based cost analysis to improve organisational profitability. Activity-based management (ABM) includes performing activities more efficiently, eliminating the need to perform certain activities that do not add value for customers, improving the design of products, and developing better relationships with customers and suppliers. The goal of ABM is to enable customer needs to be satisfied while making fewer demands on organisational resources.'

In the following paragraphs we examine some of the aspects of ABM mentioned in the definitions above.

5.2 Cost reduction and process improvement

Traditional cost analysis analyses costs by types of expense for each responsibility centre. ABM, on the other hand, analyses costs on the basis of cross-departmental activities and therefore provides management information on why costs are incurred and on the output of the activity in terms of cost drivers. **By controlling or reducing the incidence of the cost driver, the associated cost can be controlled or reduced**.

This is fundamental to ABM. At its heart is the recognition that the activities people undertake (to produce products or deliver services) consume resources, so controlling these activities allows managers to control costs at their source.

The difference between traditional cost analysis and activity-based analysis is illustrated in the example below of the activity of processing customer orders.

Traditional analysis

	$
Salaries	5,700
Stationery	350
Travel	1,290
Telephone	980
Equipment depreciation	680
	9,000

ABC analysis

	$
Preparation of quotations	4,200
Receipt of customer orders	900
Assessment of customer creditworthiness	1,100
Expedition of orders	1,300
Resolution of customer problems	1,500
	9,000

Suppose that the analysis above showed that it cost $250 to process a customer's order. This would indicate to sales staff that it may not be worthwhile chasing orders with a low sales value. By eliminating lots of small orders and focusing on those with a larger value, demand for the activities associated with customer order processing should fall, with spending decreasing as a consequence.

5.2.1 Problems associated with cost reduction and ABM

(a) The extent to which activity based approaches can be applied is very dependent on an organisation's ability to identify its main activities and their associated cost drivers.

(b) If a system of 'conventional' responsibility centres has been carefully designed, this may already be a reflection of the key organisational activities. For example, a despatch department might be a cost centre, but despatch might also be a key activity.

(c) In some circumstances, the 'pooling' of activity based costs and the identification of a single cost driver for every cost pool may even hamper effective control if the cost driver is not completely applicable to every cost within that cost pool. For example, suppose the cost of materials handling was allocated to a cost pool for which the cost driver was the number of production runs. Logically, to control the cost of materials handling the number of production runs should be controlled. If the cost is actually driven by the weight of materials being handled, however, it can only be controlled if efforts are made to use lighter materials where possible.

5.3 Activity analysis

The activity based analysis above provides information not available from a traditional cost analysis. Why was $1,500 spent on resolving customer orders, for example. An **activity analysis** usually **surprises managers** who had not realised the amount being spent on certain activities. This leads to **questions** about the **necessity for particular activities** and, if an activity is required, whether it can be carried out more effectively and efficiently.

Such questions can be answered by classifying activities as value added or non-value added (or as core/primary, support or diversionary/discretionary).

5.3.1 Value-added and non-value-added activities

Key term

> An activity may increase the worth of a product or service to the customer; in this case the customer is willing to pay for that activity and it is considered **value-added.** Some activities, though, simply increase the time spent on a product or service but do not increase its worth to the customer; these activities are **non-value-added.** (Rayborn, Barfield and Kinney, *Managerial Accounting)*

As an example, getting luggage on the proper flight is a value-added activity for airlines, dealing with the complaints from customers whose luggage gets lost is not.

The time spent on non-value-added activities creates additional costs that are unnecessary. If such activities were eliminated, costs would decrease without affecting the market value or quality of the product or service.

The processing **time** of an organisation is made up of four types.

(a) **Production** or **performance time** is the actual time that it takes to perform the functions necessary to manufacture the product or perform the service.

(b) Performing quality control results in **inspection time.**

(c) Moving products or components from one place to another is **transfer time**.

(d) Storage time and time spent waiting at the production operation for processing are **idle time**.

Production time is value added. The other three are not. The time from receipt of an order to completion of a product or performance of a service equals production time plus non-value-added time.

JIT would of course eliminate a significant proportion of the idle time occurring from storage and wait processes but it is important to realise that **very few organisations can completely eliminate all quality control functions and all transfer time**. If managers understand the non-value-added nature of these functions, however, they should be able to **minimise** such activities as much as possible.

Sometimes non-value-added activities arise because of inadequacies in existing processes and so they cannot be eliminated unless these inadequacies are addressed.

(a) The National Health Service (NHS) is a classic example of this. Some heart patients on the NHS wait up to four months for critical heart surgery. During this time they are likely to be severely ill on a number of occasions and have to be taken to hospital where they spend the day receiving treatment that will temporarily relieve the problem. This non-value-added activity is totally unnecessary and is dependent on an inadequate process: that of providing operations when required.

(b) Customer complaints services can be viewed in the same way: eliminate the source of complaints and the need for the department greatly reduces.

(c) Setting up machinery for a new production run is a non-value-added cost. If the number of components per product can be reduced the number of different components made will reduce and therefore set-up time will also reduce.

Normally one of the **costliest** things an organisation can do is to **invest in equipment and people to make non-value-added activities more efficient**. The objective is to eliminate them altogether or subject them to a major overhaul, not make them more efficient. For example, if a supplier of raw materials makes a commitment to supply high-quality materials, inspection is no longer required, and buying testing equipment and hiring more staff to inspect incoming raw material would waste time and money.

However, there are occasions when non-value-added activities are essential to remain in business. For instance, pharmaceutical companies need to meet Food and Drug Agency regulation on quality assurance which add nothing to the product or process.

5.3.2 Core/primary, support and diversionary/discretionary activities

This is an alternative classification of activities.

Key terms

A **core activity** or **primary activity** is one that adds value to a product, for example cutting and drilling materials and assembling them.

A **secondary activity** is one that supports a core activity, but does not add value in itself. For example setting up a machine so that it drills holes of a certain size is a secondary activity.

Diversionary activities or discretionary activities do not add value and are symptoms of failure within an organisation. For instance repairing faulty production work is such an activity because the production should not have been faulty in the first place.

The aim of ABM is to try to eliminate as far as possible the diversionary activities but, as with non-value-added activities, experience has shown that it is usually impossible to eliminate them all, although the time and cost associated with them can be greatly reduced.

5.4 Design decisions

In many organisations today, roughly 80% of a product's costs are committed at the product design stage, well before production begins. By **providing product designers with cost driver information** they can be encouraged to **design low cost products that still meet customer requirements.**

The identification of appropriate cost drivers and tracing costs to products on the basis of these cost drivers has the potential to **influence behaviour to support the cost management strategies of the organisation.**

For example, suppose product costs depend on the number and type of components. A product that is designed so that it uses fewer components will be cheaper to produce. A product using standard components will also be cheaper to produce. Management can influence the action of designers through overhead absorption rates if overheads are related to products on the basis of the number of component parts they contain. Hitachi's refrigeration plant uses this method to influence the behaviour of their product designers and ultimately the cost of manufacture.

5.5 Cost driver analysis

To reflect today's more complex business environment, recognition must be given to the fact that costs are created and incurred because their cost drivers occur at different levels. Cost driver analysis investigates, quantifies and explains the relationships between cost drivers and their related costs.

Classification level	Cause of cost	Types of cost	Necessity of cost
Unit level costs	Production/acquisition of a single unit of product or delivery of single unit of service	Direct materials Direct labour	Once for each unit produced
Batch level costs	A group of things being made, handled or processed	Purchase orders Set-ups Inspection	Once for each batch produced
Product/process level costs	Development, production or acquisition of different items	Equipment maintenance Product development	Supports a product type or a process
Organisational/ facility costs		Building depreciation Organisational advertising	Supports the overall production or service process

(Adapted from Raiborn *et al)*

Traditionally it has been assumed that if costs did not vary with changes in production at the unit level, they were fixed rather than variable. The analysis above shows this assumption to be false, and that costs vary for reasons other than production volume. To determine an accurate estimate of product or service cost, **costs should be accumulated at each successively higher level of costs.**

Unit level costs are allocated over number of units produced, batch level costs over the number of units in the batch, product level costs over the number of units produced by the product line. These costs are all related to units of product (merely at different levels) and so can be gathered together at the product level to match with revenue. Organisational level costs are not product related, however, and so should simply be deducted from net revenue.

Such an approach gives a far greater insight into product profitability.

5.6 Using ABC in service and retail organisations

ABC was first introduced in manufacturing organisations, and for a long time it was only considered to be relevant to manufacturing.

However, to varying degrees, all organisations have processes and activities in place which allow them to provide the products or services required by their customers or users. Therefore ABC can be used equally well be used in other types of organisation, including service companies, public sector organisations or non-for-profit organisation.

For example, when the management of the US Post Office introduced ABC they analysed the activities associated with cash processing as follows.

Activities	Examples	Possible cost driver
Unit level	Accept cash	Number of transactions
	Processing of cash by bank	Number of transactions
Batch level	'Close out' and supervisor review of clerk	Number of 'close outs'
	Deposits	Number of deposits
	Review and transfer of funds	Number of accounts
Product level	Maintenance charges for bank accounts	Number of accounts
	Reconciling bank accounts	Number of accounts

Retail organisations are considered in more detail in the context of direct product profitability later in this text, but they too **can use ABC**.

Question

ABC and retail organisations

Complete the following table to show activities and drivers that might be used in a retail organisation.

Activities	Possible cost driver

Answer

Activities	Possible cost driver
Procure goods	Number of orders
Receive goods	Number of orders or pallets
Store goods	Volume of goods
Pick goods	Number of packs
Handle returnables/recyclables	Volume of goods

5.7 Continuous improvement

Continuous improvement **recognises the concept of eliminating non-value-added activities** to reduce lead time, make products or perform services with zero defects, reduce product costs on an ongoing basis and simplify products and processes. It focuses on including employees in the process as they are often the best source of ideas.

5.8 Operational control

'**To control costs, managers must understand where costs are being incurred and for what purpose**. Some of this understanding will come from differentiating between value-added and non-value-added activities. Some will come from the better information generated by more appropriate tracing of overhead costs to products and services. Some will come from viewing fixed costs as long-term variable overheads and recognising that certain activities will cause those costs to

change. Understanding costs allows manager to visualise what needs to be done to controls those costs, to implement cost reduction activities, and to plan resource utilisation.

……By better understanding the underlying cost of making a product or performing a service, managers obtain **new insight into product or service profitability**. Such insight could **result in management decisions** about expanding or contracting product variety, raising or reducing prices, and entering or leaving a market. For example, managers may decide to raise selling prices or discontinue production of low-volume speciality output, since that output consumes more resources than does high-volume output. Managers may decide to discontinue manufacturing products that require complex operations. Or, managers may reap the benefits from low-volume or complex production through implementing high-technology processes.'

(Raiborn *et al*, with BPP emphasis)

Innes and Mitchell ('*Activity Based Costing')* report that, in some organisations,

'ABCM has also been used in **make-or-buy decisions** and has led to the sub-contracting of certain activities. In another engineering company the ABCM information on purchasing **concentrated** managers' **attention** on problems such as **late deliveries, short deliveries and poor-quality raw materials**. This information enabled this engineering company to identify twenty problem suppliers and take the necessary corrective action, which varied from changing suppliers to working with others to overcome the existing problems.'

5.9 Performance evaluation

ABM encourages and rewards employees for developing new skills, accepting greater responsibilities, and making suggestions for improvements in plant layout, product design, and staff utilisation. Each of these improvements reduces non-value-added time and cost. In addition, by focusing on activities and costs, ABM is better able to provide more appropriate measures of performance than are found in more traditional systems.

To monitor the effectiveness and efficiency of activities, performance measures relating to volume, time, quality and costs are needed.

(a) Activity **volume** measures provide an indication of the throughput and capacity utilisation of activities. For example reporting the number of times an activity such as setting-up is undertaken focuses attention on the need to investigate ways of reducing the volume of the activity and hence future costs.

(b) To increase customer satisfaction, organisations must provide a speedy response to customer requests and reduce the time taken to develop and bring a new product to the market. Organisations must therefore focus on the **time** taken to complete an activity or sequence of activities. This time can be reduced by eliminating (as far as is possible) the time spent on non-value-added activities.

(c) A focus on value chain analysis is a means of enhancing customer satisfaction. The value chain is the linked set of activities from basic raw material acquisition all the way through to the end-use product or service delivered to the customer. By viewing each of the activities in the value chain as a supplier-customer relationship, the opinions of the customers can be used to provide useful feedback on the **quality** of the service provided by the supplying activity. For example the quality of the service provided by the processing of purchase orders activity can be evaluated by users of the activity in terms of the speed of processing orders and the quality of the service provided by the supplier chosen by the purchasing activity. Such qualitative evaluations can be supported by quantitative measures such as percentage of deliveries that are late.

(d) **Cost** driver rates (such as cost per set-up) can be communicated in a format that is easily understood by all staff and can be used to motivate managers to reduce the cost of performing activities (given that cost driver rate × activity level = cost of activity). Their use as a measure of performance can induce dysfunctional behaviour, however. By splitting production runs and therefore having more set-ups, the cost per set-up can be reduced. Workload will be increased, however, and so in the long run costs could increase.

5.10 Strengths and weaknesses of ABM

Activity-based management focuses on managing the activities in the organisation that ultimately bring **value to the customer**. In this respect, ABM can focus management attention on key value-added activities, to help an organisation maintain or increase its competitive advantage. ABM also highlights the need for businesses to be focused on quality and continuous improvement.

To the extent that ABM highlights the importance of analysing the way activities add value for the customer, it has a degree of overlap with some of the other models we have looked at in this chapter (for example, the balanced scorecard and the performance pyramid, which also highlight the importance of creating value for the customer).

More specifically, ABM could be useful to organisations in helping to:

(a) Design products and services that meet or exceed customers' expectations and can be produced and delivered at a profit

(b) Identify where improvements (either continuous, or one-off transformations) are required in quality, efficiency and speed

(c) Negotiate with customers about prices, product features, quality, delivery and service.

However, ABM should not be seen as a panacea.

(a) **ABM will not, by itself, reduce costs**. It can help organisations understand their costs better in order to know what activities they have to address to reduce costs. However, the necessary actions still have to be taken to improve or re-design these activities in order to reduce the costs.

(b) Also, the **amount of work** required to set up the ABC system and in data collection must be considered, to assess whether the cost of setting up the system outweighs the benefits of having it.

(c) **Organisational and behavioural consequences**. Selected activity cost pools may not correspond to the formal structure of cost responsibilities within the organisation (the purchasing activity may spread across purchasing, production, stores, administrative and finance departments) and so determining 'ownership' of the activity and its costs may be problematic. We have already mentioned the behavioural impact of some performance measures.

Moreover, it is important not to forget the point (which is a weakness of activity based costing in general) that it can sometimes be difficult to find out what costs apply to a particular activity. Some areas of activity overlap and may be difficult to separate.

Exam focus point

An exam question on Activity-based management could be written, or require calculations, or be a mixture of both.

Exam questions may also test your knowledge of Activity-based costing (which is assumed knowledge brought forward from F5.)

The December 2010 exam required candidates to evaluate an absorption costing system compared to an ABC system, and then comment on any action that management should take in relation to product pricing. This question combined calculations and a written report, because candidates had to perform an ABC calculation on the figures given in the scenario, and then use their findings from the calculation to identify what action management should take.

6 Value-based management

FAST FORWARD

VBM aligns an organisation's overall aspirations, analytical techniques, and management processes with the **key drivers of value**. So, VBM takes the idea of creating value through return on future cash flow and embeds this in the organisational culture in its strategy, as well as making this a performance measure to be used throughout the organisation.

Focuses management attention on key value-added activities (which enhance value to customer and to customer satisfaction), key customers and key products.

Takes ABC cost analysis and uses it to improve organisational profitability.

Activity-based management (ABM)

Aspects of ABM

- **Cost reduction** (controlling/reducing the incidence of cost drivers) and process improvement.
- **Activity value analysis:**
  - Value-added and non-value-adding.
  - Eliminate non-value adding activities to reduce costs without affecting revenue.
  - Core/primary, support and diversionary/discretionary.
- **Design decisions** (providing cost driver information to ensure production of low cost products meeting customers' requirements).
- **Cost driver analysis.**
- **Continuous improvement/Kaizen** (eliminating non-value-added activities).
- **Performance evaluation** (using measures relating to volume, time, quality and cost driver rates).
- **Benchmarking** (internal, functional, competitive and strategic).

2 Business process re-engineering

Process efficiency has become increasingly important in modern business, as increased competition has forced organisations to ask questions such as: 'How should work be designed?' 'Who should do it?' and 'Where should they do it?'

Such questions indicate that process improvement and business process re-engineering (BPR) can play an important part in an organisation's strategy for sustained competitive advantage. However, the link with achieving competitive advantage means that any BPR projects should not be carried out as standalone exercises but in the context of the organisation's overall strategic position and business strategy.

In particular, it is important to identify the organisation's objectives, goals and critical success factors, in order to establish which processes link directly to these. It follows that improvements in these key processes are likely to lead to improvements in the organisation's strategic performance, and therefore suggests that these processes should be the ones which the organisation looks to improve in a BPR exercise.

FAST FORWARD

Business process re-engineering involves focusing attention inwards to consider how business processes can be redesigned or reengineered to improve efficiency.

Business process re-engineering involves focusing attention **inwards** to consider how business **processes** can be **redesigned** or re-engineered to **improve efficiency**. It *can* lead to fundamental changes in the way an organisation functions. In particular, it has been realised that processes, which were developed in a paper-intensive processing environment, may not be suitable for an environment that is underpinned by IT.

The main writing on the subject is Hammer and Champy's *Reengineering the Corporation* (1993), from which the following definition is taken.

Key term

Business Process Re-engineering (BPR) is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed.

The key words here are **fundamental, radical, dramatic** and **process**.

(a) **Fundamental** and **radical** indicate that BPR is somewhat akin to zero base budgeting: it starts by asking basic questions such as 'why do we do what we do', without making any assumptions or looking back to what has always been done in the past.

(b) **Dramatic** means that BPR should achieve 'quantum leaps in performance', not just marginal, incremental improvements.

(c) **Process**. BPR recognises that there is a need to change functional hierarchies: 'existing hierarchies have evolved into functional departments that encourage functional excellence but which do not work well together in meeting customers' requirements' (Rupert Booth, *Management Accounting*, 1994).

Key term

A **process** is a collection of activities that takes one or more kinds of input and creates an output.

For example, order fulfilment is a process that takes an order as its input and results in the delivery of the ordered goods. Part of this process is the manufacture of the goods, but under **BPR** the **aim** of **manufacturing** is **not merely to make** the goods. Manufacturing should aim to **deliver the goods that were ordered,** and any aspect of the manufacturing process that hinders this aim should be re-engineered. The first question to ask might be 'Do they need to be manufactured at all?'

A **re-engineered process** has certain **characteristics**.

(a) Often several jobs are **combined** into one.
(b) Workers often **make decisions.**
(c) The **steps** in the process are performed in **a logical order.**
(d) **Work** is performed where it **makes most sense.**

(e) Checks and controls may be reduced, and **quality 'built-in'.**
(f) One manager provides a **single point of contact.**
(g) The advantages of **centralised and decentralised** operations are combined.

2.1 Hammer's principles of BPR

(a) Processes should be designed to achieve a desired **outcome rather than** focusing on existing **tasks**.
(b) **Personnel who use** the **output** from a process should **perform the process**. For example, a company could set up a database of approved suppliers; this would allow personnel who actually require supplies to order them themselves, perhaps using on-line technology, thereby eliminating the need for a separate purchasing function.
(c) **Information processing** should be **included in the work, which produces the information**. This eliminates the differentiation between information gathering and information processing.
(d) **Geographically dispersed resources** should be **treated** as if they are **centralised.** This allows the benefits of centralisation to be obtained, for example, economies of scale through central negotiation of supply contracts, without losing the benefits of decentralisation, such as flexibility and responsiveness.
(e) **Parallel activities** should be **linked rather than integrated.** This would involve, for example, co-ordination between teams working on different aspects of a single process.
(f) **'Doers'** should be allowed to be **self-managing.** The traditional **distinction** between **workers** and **managers** can be **abolished**: decision aids such as expert systems can be provided where they are required.
(g) **Information** should be **captured once** at **source.** Electronic distribution of information makes this possible.

2.2 Business processes and the technological interdependence between departments

The value chain describes a series of activities from input of raw materials to output of finished goods/services for the customers. These activities may be organised into departments even though the actual process of adding value may cross departmental boundaries.

The **links between different departments of a business can vary**, however, and hence the **need to manage the relationships between them**. **Interdependence** is the extent to which **different departments depend on each** other to accomplish their tasks. It is possible to identify three types of interdependence.

(a) In **pooled interdependence**, each department/section works **independently** of the others, subject to achieving the overall goals of the organisation.
(b) **Sequential interdependence** is when there is a sequence (or a **linked** chain of activities) with a **start** and **end** point. An example is an assembly line: raw materials are taken, moulded to the right sizes and shapes and are assembled into a product. The **outputs** of each stage sequence must be precisely tailored to the **inputs** of the next – standardisation of outputs, might be one form of co-ordination used. The first activity must be performed correctly before the second can be tackled. **Management effort** is required to ensure that the **transfer of resources between departments is smooth**. They therefore need information about the process as a whole.
(c) **Reciprocal interdependence** exists when a **number of departments acquire inputs from and offer outputs to each other**. In other words, while resources have to be transferred, there is **no preset sequence**. The output of one department might be sent to another for processing, and then returned to the original department.

You should now have some idea as to the complexities of business processes overlapping different departments. **Some organisations have redesigned their structures on the lines of business processes**, adopting BPR to **avoid** all the co-ordination problems caused by reciprocal interdependence.

2.3 Key characteristics of organisations which have adopted BPR

(a) **Work units change from functional departments to process teams, which replace the old functional structure.**

(i) For example, within a functional framework, a sales order may be handled by many different people, in different departments or business functions. (One person takes the order in the department, and one person delivers).

(ii) In process teams, the people are grouped together. A case team might combine to do all the work on a process and this applies not only to one-off projects but to recurring work.

Multi-skilling also means that one individual does many of the tasks in a process.

(b) **Jobs change**. People do more, as team members are responsible for results. This ties in with **job enlargement** and **job enrichment**.

(c) **People's roles change**. They are empowered to make decisions relevant to the process.

(d) **Performance measures concentrate on results** rather than activities. Process teams create 'value' which is measurable.

(e) Organisation structures change from **hierarchical** to **flat** (ie delayered).

(i) When a process becomes the work of a **whole team**, managing the process is the **team's responsibility**. Interdepartmental issues become matters the team resolves itself, rather than matters requiring managerial intervention.

(ii) Companies require less managerial input. **Managers have less to do**; there are fewer of them and so fewer layers.

(iii) Organisation structure determines lines of communication, and in many organisations is a weighty issue. This is not the case in process organisations, as **lines of communication 'naturally' develop around business processes**.

2.4 Implications of BPR for accounting systems

Issue	Implication
Performance measurement	Performance measures must be built around processes not departments: this may affect the design of responsibility centres.
Reporting	There is a need to identify where value is being added.
Activity	ABC might be used to model the business processes.
Structure	The complexity of the reporting system will depend on the organisational structure. Arguably the reports should be designed round the process teams, if there are independent process teams.
Variances	New variances may have to be developed.

Exam focus point

Benchmarking, which we discussed in Chapter 1 of this Study Text, could also be useful in the context of a BPR exercise.

Once an organisation has identified which its key processes are, it will also then have to decide which of them need to be re-engineered. This will depend on the performance of the organisation's processes compared to its competitors or to other organisations in different industries which use similar processes.

In order to make this decision, the organisation will need to compare the performance of its processes with the other organisations', which it can do by benchmarking its processes.

Case Study

The case of **Taco Bell** is one of the examples quoted in Hammer and Champy's book. (The emphasis added is BPP's.)

In the 1980s, the company was entrenched in a command and control hierarchy that claimed to understand what customers wanted, but did not ask directly. But major re-engineering efforts – automating, changing the organisational structure and management system, reducing kitchen space, and increasing customer space – focusing on what customers really wanted, greatly simplified their processes.

These changes have had a huge impact on the company. It went from a failing regional Mexican-American fast food chain with $500 million in sales in 1982, to a $3 billion national company 10 years later, with a goal to expand further to $20 billion.

One BPR initiative was the **K-Minus program, or kitchenless restaurant**. Based on the belief that they were a service company, not a manufacturer, a large majority of the restaurants' food preparation now occurs at central commissaries rather than in the restaurant, **pushing 15 hours of work a day out of the restaurant**, **improving quality control and employee morale**, **reducing employee accidents and injuries**, and resulting in **substantial savings on utilities**. The K-Minus program saves Taco Bell about $7 million a year.

2.5 Examples of business process re-engineering

(a) A move from a traditional functional plant layout to a JIT cellular product layout is a simple example.

(b) **Elimination of non-value-added activities**. Consider a materials handling process, which incorporates scheduling production, storing materials, processing purchase orders, inspecting materials and paying suppliers.

This process could be re-engineered by sending the production schedule direct to nominated suppliers with whom contracts are set up to ensure that materials are delivered in accordance with the production schedule and that their quality is guaranteed (by supplier inspection before delivery).

Such re-engineering should result in the elimination or permanent reduction of the non-value-added activities of storing, purchasing and inspection.

Case Study

Example of BPR.

A company employs 25 staff to perform the standard accounting task of matching goods received notes with orders and then with invoices. A process review established that 50% of employees' time was spent trying to match the 20% of document sets that do not agree.

One way of improving the situation would be to computerise the existing process to facilitate matching. This would help, but BPR would go further.

A BPR approach may question why any incorrect orders are accepted. To enable incorrect orders to be identified before being accepted, all orders could first be entered into a computerised database. When goods arrive, they either agree to goods that have been ordered (as recorded in the database) or they don't.

Goods that agree to an order are accepted and paid for. Goods that are not agreed are sent back to the supplier. Time is not wasted trying to sort out unmatched documents.

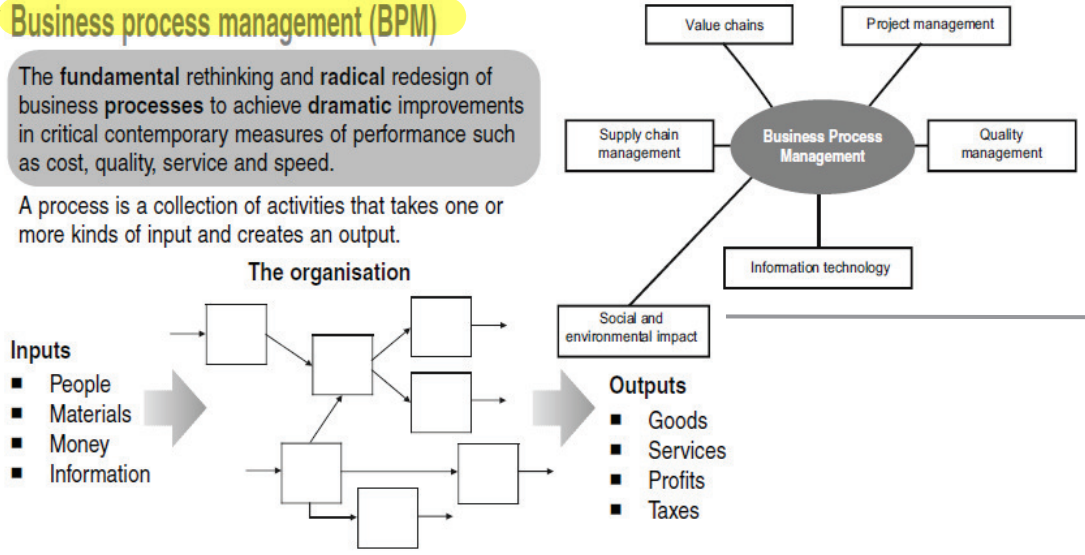
Gains would include staff time saved, quicker payment for suppliers, lower inventory costs, and lower investment in working capital.

Popular in the 1990s as a technique for rethinking business processes and reducing value chain costs.

Business process management (BPM)

The **fundamental** rethinking and **radical** redesign of business **processes** to achieve **dramatic** improvements in critical contemporary measures of performance such as cost, quality, service and speed.

A process is a collection of activities that takes one or more kinds of input and creates an output.



Aim: fundamental examination of all parts of a process with the intention of lowering the value chain cost.

2b Target costing

Topic list	Syllabus reference
1 What is target costing?	A2 (a)
2 Implementing target costing	A2 (a)
3 Deriving a target cost	A2 (a)
4 Closing a target cost gap	A2 (c)
5 Target costing in service industries	A2 (b)

Introduction

Target costing is the second specialist cost accounting technique we will consider. In the modern competitive environment, organisations have to continually redesign their products or services and it is essential that they try to achieve a target cost during product and process development.

Target costing is a cost management process which involves setting a target cost by subtracting a desired profit margin from a competitive market price.

Study guide

		Intellectual level
A2	**Target costing**	
(a)	Derive a target cost in manufacturing and service industries	2
(b)	Explain the difficulties of using target costing in service industries	2
(c)	Suggest how a target cost gap might be closed	2

Exam guide

Target costing may form part of a question comparing its use to other costing techniques or it may form an entire question including calculation of a target cost.

1 What is target costing? 12/07

FAST FORWARD

Target costing involves setting a target cost by subtracting a desired profit margin from a competitive market price.

To compete effectively, organisations must continually redesign their products (or services) in order to shorten **product life cycles** (see Chapter 2c). The **planning, development and design stage** of a product is therefore **critical** to an organisation's cost management process. Considering possible **cost reductions at this stage** of a product's life cycle (rather than during the production process) is now one of the most **important** issues facing management accountants in industry.

Here are some examples of **decisions made at the design stage** which **impact on the cost of a product.**

- The number of different components
- Whether the components are standard or not
- The ease of changing over tools

Japanese companies have developed target costing as a response to the **problem of controlling and reducing costs** over the product life cycle.

Key terms

Target costing involves setting a target cost by subtracting a desired profit margin from a competitive market price.

Target cost is an estimate of a product cost which is determined by subtracting a desired profit margin from a competitive market price. This target cost may be less than the planned initial product cost but it is expected to be achieved by the time the product reaches the maturity stage of the product life cycle.

2 Implementing target costing 6/12

In 'Product costing/pricing strategy' (*ACCA Students Newsletter*, August 1999),one of the examiners provided a useful summary of the steps in the implementation of the target costing process.

Step 1 Determine a product specification of which an adequate sales volume is estimated.

Step 2 Set a selling price at which the organisation will be able to achieve a desired market share.

Step 3 Estimate the required profit based on return on sales or return on investment.

Step 4 Calculate the target cost = estimated selling price – target profit.

Step 5 Compile an estimated cost for the product based on the anticipated design specification and current cost levels.

Step 6 Calculate target cost gap = estimated cost – target cost.

Step 7 Make efforts to close the gap. This is more likely to be successful if efforts are made to 'design out' costs prior to production, rather than to 'control out' costs during the production phase.

Step 8 Negotiate with the customer before making the decision about whether to go ahead with the project.

Case Study

Swedish retailer IKEA continues to dominate the home furniture market with more than 300 stores across 35 countries at the end of 2009. The "IKEA concept" as defined on the company website www.ikea.com is "based on offering a wide range of well designed functional home furnishing products at prices so low as many people as possible will be able to afford them."

IKEA is widely known for pricing products at 30-50% below the price charged by competitors. Extracts from the website outline how the company has successfully employed a strategy of target pricing:

"While most retailers use design to justify a higher price, IKEA designers work in exactly the opposite way. Instead they use design to secure the lowest possible price. IKEA designers design every IKEA product starting with a functional need and a price. Then they use their vast knowledge of innovative, low-cost manufacturing processes to create functional products, often co-ordinated in style. Then large volumes are purchased to push prices down even further.

Most IKEA products are also designed to be transported in flat packs and assembled at the customer's home. This lowers the price by minimising transportation and storage costs. In this way, the IKEA Concept uses design to ensure that IKEA products can be purchased and enjoyed by as many people as possible."

3 Deriving a target cost

The target cost is calculated by starting with a market-based price and subtracting a desired profit margin. The target cost is simply the price minus the profit.

3.1 Example: Target costing

A car manufacturer wants to calculate a target cost for a new car, the price of which will be set at $17,950. The company requires an 8% profit margin.

Required

What is the target cost?

Solution

Profit required = 8% × $17,950 = $1,436
Target cost = $(17,950 – 1,436) = $16,514

The car manufacturer will then need to carefully compile an estimated cost for the new car. ABC will help to ensure that costs allocated to the new model are more accurate.

3.2 Example: Target costing and the target cost gap

Great Games, a manufacturer of computer games, is in the process of introducing a new game to the market and has undertaken market research to find out about customers' views on the value of the product and also to obtain a comparison with competitors' products. The results of this research have been used to establish a target selling price of $60.

Cost estimates have been prepared based on the proposed product specification.

Manufacturing cost	$
Direct material	3.21
Direct Labour	24.03
Direct machinery costs	1.12
Ordering and receiving	0.23
Quality assurance	4.60
Non-manufacturing costs	
Marketing	8.15
Distribution	3.25
After-sales service	1.30

The target profit margin for the game is 30% of the proposed selling price

Required

Calculate the target cost of the new game and the target cost gap.

Solution

	$
Target selling price	60.00
Target profit margin (30% of selling price)	18.00
Target cost (60.00 – 18.00)	42.00
Projected cost	45.89

The projected cost exceeds the target cost by $3.89. This is the target cost gap. Great Games will therefore have to investigate ways to drive the actual cost down to the target cost.

4 Closing a target cost gap 12/07

The **target cost gap** is the estimated cost less the target cost. When a product is first manufactured, its target cost may well be much lower than its currently-attainable cost, which is determined by current technology and processes. Management can then set **benchmarks for improvement** towards the target costs, by improving technologies and processes. Various techniques can be employed.

- Reducing the **number of components**
- Using **standard components** wherever possible
- **Training** staff in more efficient techniques
- Using **different materials**
- Using **cheaper staff**
- Acquiring new, more efficient **technology**
- Cutting out **non-value-added activities** (identified using **activity analysis** etc)

Even if the product can be produced within the target cost the story does not end there. Target costing can be applied throughout the entire life cycle. Once the product goes into production target costs will therefore gradually be reduced. These reductions will be incorporated into the budgeting process. This means that cost savings must be actively sought and made continuously over the life of the product.

Exam focus point

When answering a question on closing a target cost gap, make sure you refer to the specific circumstances of the business in the question.

5 Target costing in service industries 6/12

Target costing is difficult to use in service industries due to the **characteristics** and **information requirements** of service businesses.

5.1 Characteristics of services

FAST FORWARD

Unlike manufacturing companies, services are characterised by **intangibility, inseparability, variability, perishability** and no **transfer of ownership.**

Examples of service businesses include:

(a) **Mass service** eg the banking sector, transportation (rail, air), mass entertainment
(b) **Either / or** eg fast food, teaching, hotels and holidays, psychotherapy
(c) **Personal service** eg pensions and financial advice, car maintenance

Key term

"Services are any activity of benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything. Its production may or may not be tied to a physical product."
(P Kotler, *Social Marketing)*

There are **five major characteristics** of services that distinguish services from manufacturing.

(a) **Intangibility** refers to the lack of substance which is involved with service delivery. Unlike goods (physical products such as confectionery), there is no substantial material or physical aspects to a service: no taste, feel, visible presence and so on. For example, if you go to the theatre, you cannot take the 'play' with you.
(b) **Inseparability/simultaneity**. Many services are created at the same time as they are consumed. (Think of dental treatment.) No service exists until it is actually being experienced/consumed by the person who has bought it.
(c) **Variability/heterogeneity**. Many services face the problem of maintaining consistency in the standard of output. It may be hard to attain precise standardisation of the service offered, but customers expect it (such as with fast food).
(d) **Perishability.** Services are innately perishable. The services of a beautician are purchased for a period of time.
(e) **No transfer of ownership.** Services do not result in the transfer of property. The purchase of a service only confers on the customer access to or a right to use a facility.

5.2 Information requirements of services

FAST FORWARD

Service businesses need the same aggregate information as manufacturing firms, but also need performance data as to their cost and volume drivers. Operational information is likely to be more qualitative.

A service business needs a mix of **quantitative** and **non-quantitative** information to price its services properly, to optimise capacity utilisation and to monitor performance.

(a) They need to control the **total cost** of providing the **service operation**.
(b) They need positive **cash flow** to **finance activities**.
(c) They need **operating information** to identify how costs are incurred and on what services.

Arguably, small service businesses, whose expenses are mainly overheads, provide a model, in miniature, of the requirements of **activity based costing**.

Are **'mass services'** any different?

(a) Because mass services, such as cheque clearing, are largely automated, there may be a large **fixed cost base**.

(b) Even if a service is heavily automated, each time the service is performed is a 'moment of truth' for the customer. Ensuring consistency and quality is important but this is true for small service businesses too.

Service industries, perhaps more than manufacturing firms, **rely on their staff**. Front-line staff are those who convey the 'service' – and the experience of the brand – to the consumer. They convey the 'moment of truth' with the customer.

For service businesses, **management accounting information** should **incorporate** the **key drivers of service costs**.

- Repeat business
- Churn rate (for subscriptions)*
- Customer satisfaction surveys, complaints
- Opportunity costs of not providing a service
- Avoidable / unavoidable costs

* For any given period of time, the number of participants who discontinue their use of a service divided by the average number of total participants is the churn rate. Churn rate provides insight into the growth or decline of the subscriber base as well as the average length of participation in the service.

Chapter Roundup

- **Target costing** involves setting a target cost by subtracting a desired profit margin from a competitive market price.
- Unlike manufacturing companies, services are characterised by **intangibility, inseparability, variability, perishability** and no **transfer of ownership.**
- **Service businesses need the same aggregate information** as manufacturing firms, but also need performance data as to their cost and volume drivers. Operational information is likely to be more qualitative.

Quick Quiz

1 *Fill in the blanks using words from the list (a) to (h).*

Target cost = ... – .....

Cost gap = ... – .....

(a)	target cost	(e)	target selling price
(b)	cost gap	(f)	estimated cost
(c)	budgeted selling price	(g)	estimated selling price
(d)	production cost	(h)	target profit

2 Which of the following are the five major characteristics of services that distinguish services from manufacturing?

(a)	Intangibility	(e)	Heterogeneity
(b)	Perishability	(f)	Variability
(c)	Inseparability	(g)	Simultaneity
(d)	No transfer of ownership		

Answers to Quick Quiz

1 Target cost = estimated selling price – target profit
Cost gap = estimated cost – target cost

2 This was a bit of a trick question as there are no 'odd ones out'. Inseparability and simultaneity mean the same thing, as do variability and heterogeneity.

2C Life cycle costing

Topic list	Syllabus reference
1 What are life cycle costs?	A3 (a)
2 The product life cycle	A3 (c)
3 Life cycle costing in manufacturing and service industries	A3 (b)

Introduction

Life cycle costing is the third specialist cost accounting technique we will consider. It accumulates costs over a **product's life** rather than on a periodic basis and enables the determination of the **total profitability** of any given product.

Study guide

		Intellectual level
A3	**Life cycle costing**	
(a)	Identify the costs involved at different stages of the life cycle	2
(b)	Derive a life cycle cost in manufacturing and service industries	2
(c)	Identify the benefits of life cycle costing	2

Exam guide

Life cycle costing will probably form part of a question on costing techniques but it has equal weighting in the syllabus as the other management accounting techniques, so could form an entire question.

1 What are life cycle costs? 12/08, 12/11

FAST FORWARD

Life cycle costing tracks and accumulates costs and revenues attributable to each product over the entire product life cycle.

A product's life cycle costs are incurred **from its design stage through development to market launch, production and sales, and finally to its eventual withdrawal from the market**. The component elements of a product's cost over its life cycle could therefore include the following.

- **Research & development costs**
  - Design
  - Testing
  - Production process and equipment
- The **cost of purchasing any technical data** required
- **Training costs** (including initial operator training and skills updating)
- **Production costs**
- **Distribution costs**. Transportation and handling costs
- **Marketing costs**
  - Customer service
  - Field maintenance
  - Brand promotion
- **Inventory costs** (holding spare parts, warehousing and so on)
- **Retirement and disposal costs**. Costs occurring at the end of a product's life

Life cycle costs can apply to **services**, customers and projects as well as to physical products.

Traditional cost accumulation systems are based on the financial accounting year and tend to dissect a product's life cycle into a series of 12-month periods. This means that traditional management accounting systems **do not accumulate costs over a product's entire life cycle** and **do not** therefore **assess a product's profitability over its entire life.** Instead they do it on a periodic basis.

Life cycle costing, on the other hand, **tracks and accumulates actual costs and revenues** attributable to each product **over the entire product life cycle.** Hence the total profitability of any given product can be determined.

Key term

Life cycle costing is the accumulation of costs over a product's entire life.

2 The product life cycle

FAST FORWARD

A **product life cycle** can be divided into five phases.

- Development
- Introduction
- Growth
- Maturity
- Decline

Every product goes through a life cycle.

(a) **Development.** The product has a research and development stage where costs are incurred but no revenue is generated.

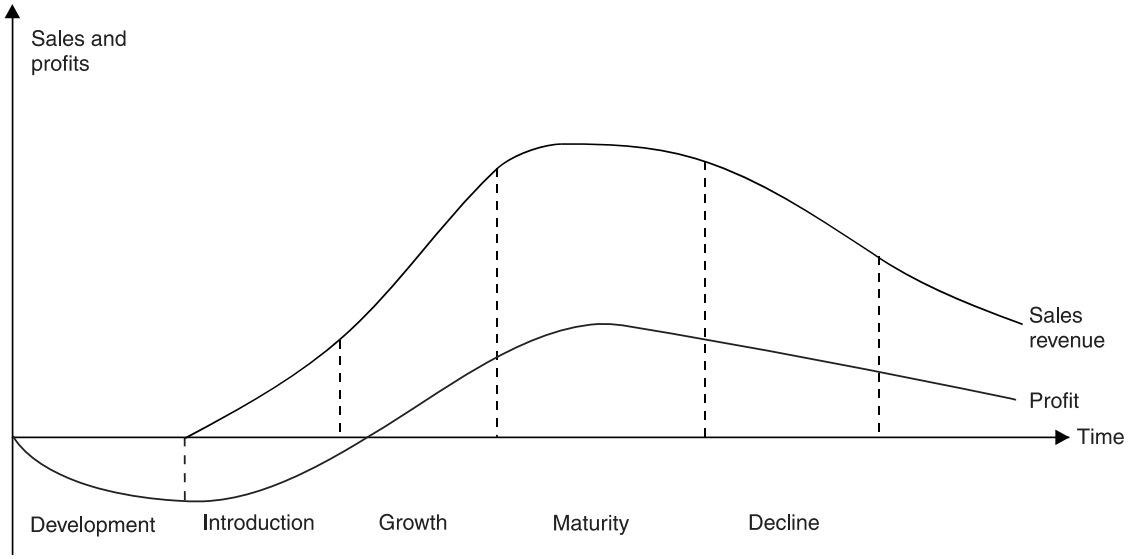
(b) **Introduction**. The product is introduced to the market. Potential customers will be unaware of the product or service, and the organisation may have to spend further on advertising to bring the product or service to the attention of the market.

(c) **Growth**. The product gains a bigger market as demand builds up. Sales revenues increase and the product begins to make a profit.

(d) **Maturity**. Eventually, the growth in demand for the product will slow down and it will enter a period of relative maturity. It will continue to be profitable. The product may be modified or improved, as a means of sustaining its demand.

(e) **Decline**. At some stage, the market will have bought enough of the product and it will therefore reach 'saturation point'. Demand will start to fall. Eventually it will become a loss-maker and this is the time when the organisation should decide to stop selling the product or service.

The level of sales and profits earned over a life cycle can be illustrated diagrammatically as follows.



The horizontal axis measures the duration of **the life cycle**, which **can last** from, say, **18 months to several hundred years**. Children's crazes or fad products have very short lives while some products, such as binoculars (invented in the eighteenth century) can last a very long time.

2.1 Problems with traditional cost accumulation systems

Traditional cost accumulation systems do not tend to relate **research and development costs** to the products that caused them. Instead they **write off** these costs on an annual basis **against** the **revenue generated by existing products**. This makes the existing products seem **less profitable** than they really are. If research and development costs are not related to the causal product the true profitability of that product cannot be assessed.

Traditional cost accumulation systems usually **total all non-production costs** and record them as a **period expense**.

2.2 The benefits of life cycle costing 12/11

There are a number of benefits associated with life cycle costing.

(a) The life cycle concept results in earlier actions to generate revenue or to lower costs than otherwise might be considered.

(b) Better decisions should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.

(c) Life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding.

(d) The life cycle concept helps managers to understand acquisition costs vs. operating and support costs. It encourages businesses to find a correct balance between investment costs and operating expenses.

3 Life cycle costing in manufacturing and service industries

FAST FORWARD

Both manufacturing and service industries take similar steps to ensure that returns are maximised over the product/service life cycle.

With life cycle costing, non-production costs are traced to individual products over complete life cycles.

(a) The total of these costs for each individual product can therefore be reported and compared with revenues generated in the future.

(b) The visibility of such costs is increased.

(c) **Individual product profitability can be better understood** by attributing *all* costs to products.

(d) As a consequence, **more accurate feedback information** is available on the organisation's success or failure in developing new products. In today's competitive environment, where the ability to produce new or updated versions of products is paramount to the survival of an organisation, this information is vital.

3.1 The importance of the early stages of the life cycle

It is reported that some organisations operating within an **advanced manufacturing technology** environment find that approximately 90% of a product's life cycle cost is determined by decisions made early within the cycle at the design stage. Life cycle costing is therefore particularly suited to such organisations and products, monitoring spending and commitments to spend during the early stages of a product's life cycle.

In order to compete effectively in today's competitive market, organisations need to **redesign continually their products** with the result that **product life cycles** have become much **shorter**. The **planning, design and development stages of a product's cycle** are therefore **critical** to an organisation's cost management process. Cost reduction at this stage of a product's life cycle, rather than during the production process, is one of the most important ways of reducing product cost.

3.2 Maximising the return over the product life cycle

3.2.1 Design costs out of products

Between 70% to 90% of a product's life cycle costs are determined by decisions made early in the life cycle, at the design or development stage. Careful design of the product and manufacturing and other processes will keep cost to a minimum over the life cycle.

3.2.2 Minimise the time to market

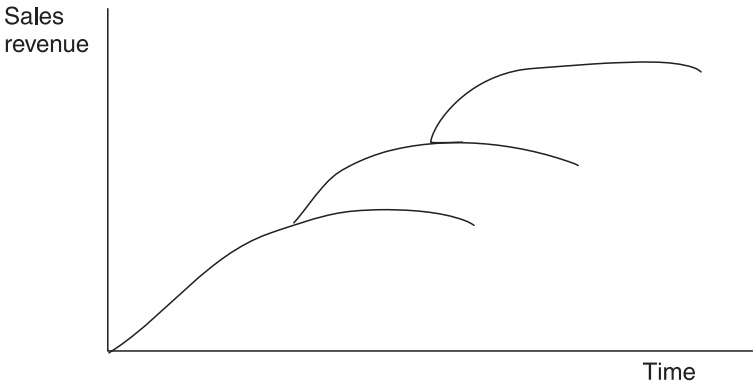
This is the time from the conception of the product to its launch. More products come onto the market nowadays and development times have been reduced over the years. Competitors watch each other very carefully to determine what types of product their rivals are developing. If an organisation is launching a new product it is vital to get it to the market place as soon as possible. This will give the product as long a period as possible without a rival in the market place and should mean increased market share in the long run. Furthermore, the life span may not proportionally lengthen if the product's launch is delayed and so sales may be permanently lost. It is not unusual for the product's overall profitability to fall by 25% if the launch is delayed by six months. This means that it is usually worthwhile incurring extra costs to keep the launch on schedule or to speed up the launch.

3.2.3 Minimise breakeven time (BET)

A short BET is very important in keeping an organisation liquid. The sooner the product is launched the quicker the research and development costs will be repaid, providing the organisation with funds to develop further products.

3.2.4 Maximise the length of the life span

Product life cycles are not predetermined; they are set by the actions of management and competitors. Once developed, some products lend themselves to a number of different uses; this is especially true of materials, such as plastic, PVC, nylon and other synthetic materials. The life cycle of the material is then a series of individual product curves nesting on top of each other as shown below.



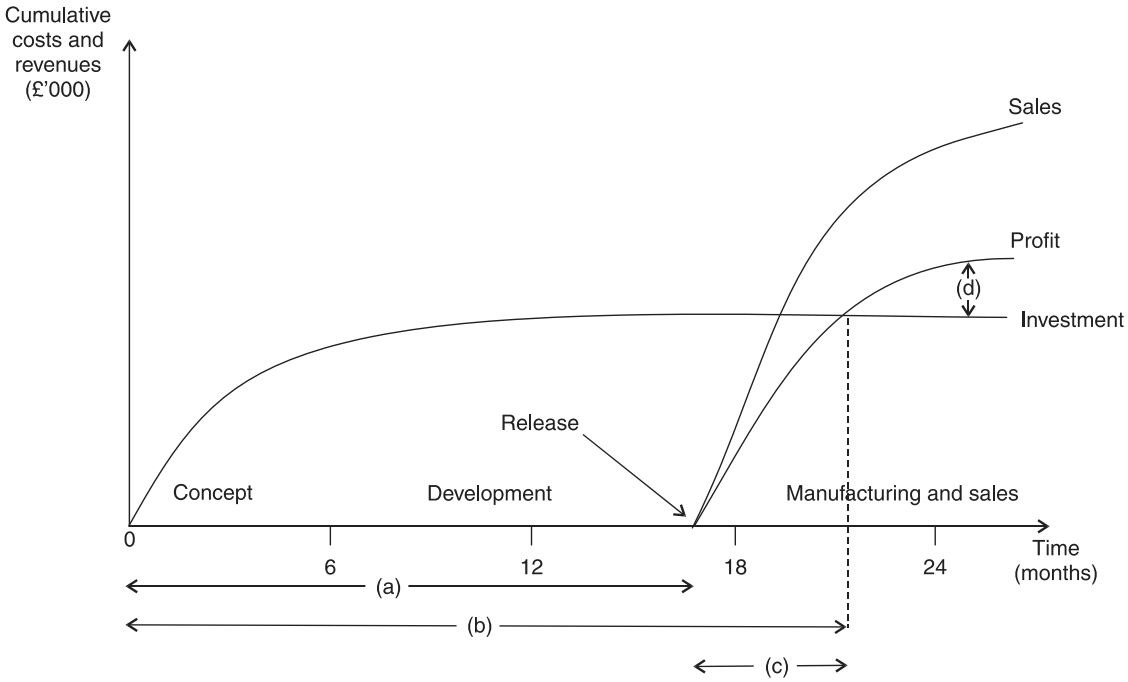
By entering different national or regional markets one after another an organisation may be able to maximise revenue. This allows resources to be better applied, and sales in each market to be maximised. On the other hand, in today's fast moving world, an organisation could lose out to a competitor if it failed to establish an early presence in a particular market.

3.2.5 Minimise product proliferation

If products are updated or superseded too quickly, the life cycle is cut short and the product may just cover its R and D costs before its successor is launched.

3.2.6 Manage the product's cashflows

Hewlett-Packard developed a **return map** to manage the lifecycle of their products. Here is an example.



Key time periods are measured by the map:

(a) Time to market
(b) Breakeven time
(c) Breakeven time after product launch
(d) Return factor (the excess of profit over the investment)

Changes to planned time periods can be incorporated into the map (for example, if the development plan takes longer than expected) and the resulting changes to the return factor at set points after release highlighted.

3.3 Service and project life cycles

A service organisation will have services that have life cycles. The only difference is that the **R & D stages** will not exist in the same way and will not have the same **impact** on subsequent costs. The **different processes** that go to form the complete service are important, however, and consideration should be given in advance as to how to carry them out and arrange them so as to minimise cost.

Products that take years to produce or come to fruition are usually called **projects**, and **discounted cash flow calculations** are invariably used to cost them over their life cycle in advance. The projects need to be **monitored** very carefully over their life to make sure that they **remain on schedule** and that **cost overruns** are not being incurred.

3.4 Customer life cycles

Customers also have life cycles, and an organisation will wish to **maximise the return from a customer over their life cycle**. The aim is to **extend the life cycle of a particular customer** or decrease the 'churn' rate, as the Americans say. This means **encouraging customer loyalty**. For example, some supermarkets and other retail outlets issue **loyalty cards** that offer discounts to loyal customers who return to the shop and spend a certain amount with the organisation. As existing customers tend to be more profitable than new ones they should be retained wherever possible.

Customers become more profitable over their life cycle. The profit can go on increasing for a period of between approximately four and 20 years. For example, if you open a bank account, take out insurance or invest in a pension, the company involved has to set up the account, run checks and so on. The initial cost is high and the company will be keen to retain your business so that it can recoup this cost. Once customers get used to their supplier they tend to use them more frequently, and so there is a double benefit in holding on to customers. For example, you may use the bank to purchase shares on your behalf, or you may take out a second insurance policy with the same company.

The projected cash flows over the full lives of customers or customer segments can be analysed to highlight the worth of customers and the importance of customer retention. It may take a year or more to **recoup the initial costs of winning a customer**, and this could be referred to as the **payback period** of the investment in the customer.

Question

Life cycle costing

Solaris specialises in the manufacture of solar panels. It is planning to introduce a new slimline solar panel specially designed for small houses. Development of the new panel is to begin shortly and Solaris is in the process of determining the price of the panel. It expects the new product to have the following costs.

	Year 1	*Year 2*	*Year 3*	*Year 4*
Units manufactured and sold	2,000	15,000	20,000	5,000
	$	$	$	$
R&D costs	1,900,000	100,000	-	-
Marketing costs	100,000	75,000	50,000	10,000
Production cost per unit	500	450	400	450
Customer service costs per unit	50	40	40	40
Disposal of specialist equipment				300,000

The Marketing Director believes that customers will be prepared to pay $500 for a solar panel but the Financial Director believes this will not cover all of the costs throughout the lifecycle.

Required

Calculate the cost per unit looking at the whole life cycle and comment on the suggested price.

Answer

Life cycle costs

	$'000
R&D (1,900 + 100)	2,000
Marketing (100 + 75 + 50 + 10)	235
Production (1,000 + 6,750 + 8,000 + 2,250)	18,000
Customer service (100 + 600 + 800 + 200)	1,700
Disposal	300
Total lifecycle costs	22,235
Total production ('000 units)	42
Cost per unit	529.40

The total life cycle costs are $529.40 per solar panel which is higher than the price proposed by the marketing director. Solaris will either have to charge a higher price or look at ways to reduce costs.

It may be difficult to increase the price if customers are price sensitive and are not prepared to pay more. Costs could be reduced by analysing each part of the costs throughout the life cycle and actively seeking cost savings. For example, using different materials, using cheaper staff or acquiring more efficient technology.

Chapter Roundup

- **Life cycle costing** tracks and accumulates costs and revenues attributable to each product over the entire product life cycle.
- A **product life cycle** can be divided into five phases.
  - Development
  - Introduction
  - Growth
  - Maturity
  - Decline
- Both manufacturing and service industries take similar steps to ensure that returns are maximised over the product/service life cycle.

Quick Quiz

1 *Match the following costs to the appropriate life cycle cost classification.*

Costs	*Classifications*
Design	Inventory costs
Energy costs	Acquisition costs
Warehousing	Maintenance costs
Transportation	Operation costs
Customer service	Product distribution costs

2 Life cycle costing is the profiling of cost over a product's production life. **True or false?**

3 Life cycle costing is particularly useful in an AMT environment, where 10% of a product's life cycle costs might be determined by decisions made early within the cycle at the design stage. **True or false?**

Answers to Quick Quiz

1

Cost	*Classification*
Design	Acquisition costs
Energy costs	Operation costs
Warehousing	Inventory costs
Transportation	Product distribution costs
Customer service	Maintenance costs

2 False. It also looks at development costs and so on which are incurred prior to production, and any dismantling costs, which are incurred once production ceases.

3 False. The percentage is usually much higher.

Now try the question below from the Exam Question Bank

Number	Level	Marks	Time
Q4	Introductory	17	31 mins

11 The role of quality in management information and performance measurement systems

Topic list	Syllabus reference
1 Quality overview	D6
2 Modern Japanese business practices and techniques	D6(a)
3 The terminology of quality management	D6(b)
4 The ISO 9000:2000 and 2008 series of standards	D6(d)
5 The quality management system	D6(c) and (d)
6 Quality in management information systems	D6(e)
7 The qualities of good information and good management information systems	D6(e)
8 Six Sigma and quality improvement	D6 (f)

Introduction

The achievement of a consistent, desired level of quality is a vital feature of putting strategy into action.

It is important to understand that consistence of *satisfactory* quality is, for most organisations, more important and appropriate than striving for the *highest* quality and sometimes failing to achieve it.

In this chapter we will examine some modern approaches to quality management. These approaches to quality tend to have common features, but make sure you understand the areas in which they differ.

Study guide

		Intellectual level
D6	**The role of quality in management information and performance measurement systems**	
(a)	Discuss and evaluate the application of Japanese business practices and management accounting techniques, including: (i) Kaizen costing (ii) Target costing (iii) Just-in-time (iv) Total quality management	3
(b)	Discriminate between quality, quality assurance, quality control and quality management	2
(c)	Assess the relationship of quality management to the performance management strategy of an organisation	3
(d)	Advise on the structure and benefits of quality management systems and quality certification	3
(e)	Justify the need and assess the characteristics of quality in management information systems	3
(f)	Discuss and apply Six Sigma as a quality improvement method using tools such as DMAIC for implementation	2

Exam guide

Quality has been a dominant theme is management thinking for the last fifty years. Consideration of quality is a fundamental part of strategy, and the word 'quality' is often mentioned in organisations' mission statements. Quality may also be an important feature of process and e-business design.

Questions on quality could either be standalone questions on specific models or quality issues, or they could be integrated with other topics such as IT or business process change.

The first section of the Chapter provides some background, explaining the history of quality management. This will help you see how modern approaches have developed. Some of the ideas here may be familiar, if only through phrases such as quality circles. However, you will not be expected to write on the history of quality management in your exam.

1 Quality overview

FAST FORWARD

Quality management has developed from an inspection-based process to a philosophy of business that emphasises customer satisfaction, the elimination of waste and the acceptance of responsibility for conformance with quality specifications at all stages of all business processes.

1.1 Traditional approaches to quality

There has been a rise in awareness of quality and the systems that support it, to the extent that it has become of **strategic significance**. Quality is now considered to be of fundamental importance to many organisations. Indeed, many firms pursue a **strategy of differentiation based on high quality**.

There was a time when quality was not measured as an output target, and when managers considered it something to be added on to a product rather than something that was integral to it. Quality control applied largely to manufacturing and meant **inspection**, or identifying when defective items are being produced at an unacceptable level.

There are many problems with this approach.

(a) The inspection process itself **does not add value**: if it could be guaranteed that no defective items were produced, there would be no need for a separate inspection function.

(b) The **production of substandard products is a waste** of raw materials, machine time, human effort and overhead cost.

(c) The inspection department takes up possibly expensive **land and warehousing space**.

(d) The production of defects is **not compatible with newer production techniques** such as just-in-time: there is no time for inspection.

(e) **Working capital is tied up** in inventories that cannot be sold.

In other words, the inspection approach builds **waste** into the process, which is not acceptable: the resources it consumes can be put to better use.

1.2 The development of quality management

Quality management is not new. Below, we give a brief guide to some of the major ideas behind the development of quality management. An important theme running through this process is the gradual expansion of the quality idea from a **technique** forming part of the management of manufacturing output to its current status as a **philosophy of business** and vital component of strategy. Partly as a result of this development, the threshold level of quality capability has gradually risen, so that high quality standards are now taken for granted.

This last point is important. Threshold values of quality have increased in most organisations over the last few decades. Therefore if an organisation wants to use 'high quality' as part of a differentiation strategy, then the levels of quality it must achieve must also increase, to maintain the differentiation from all the other organisations.

1.3 Deming

W Edwards Deming is one of the founding fathers of the quality movement. Deming's first job in this field was to use **statistical process control** to raise productivity in US factories during World War II. His ideas were adopted in Japan, once he was able to convince Japanese business leaders of their merits. Deming has asserted that over 90% of a company's problems can be corrected only by management, as management has the sole authority to change the system.

Deming's book *Out of the Crisis* listed fourteen points for managers to adopt to improve quality and competitiveness. These are summarised as follows.

(a) Improving products and services must be a constant purpose of the organisation

(b) Eliminate all waste. (This was especially important in Japan, which has few sources of raw materials).

(c) Cease depending on mass inspection to achieve quality. This ties up resources and working capital in stocks.

(d) Price should not be the only consideration in choosing a supplier. Quality and reliability are also important.

(e) Improve the systems for production and service delivery. This reduces waste and enhances quality by ensuring the production system works optimally.

(f) Train people so they are better at working, and understand how to optimise production.

(g) Lead people.

(h) 'Drive out fear'.

(i) Break down barriers between staff areas.

(j) Get rid of slogans, exhortations, targets. These can be alienating.

(k) Get rid of numerical quotas. These encourage the wrong attitude to production.

(l) Enable people to take pride in work.

(m) Encourage 'education and self improvement for everyone'.

(n) Action should be taken to accomplish quality objectives.

The abandonment of mass inspection to assess quality implies that quality must be built in from the beginning, not added on at the end.

1.4 Crosby

Philip B Crosby is chiefly known for two concepts.

(a) **Zero defects**: there should never be any defects in a product. Some consider this to be an impossible ideal, and invoke the concept of diminishing returns. Alternatively it can be seen as a slogan to employees.

(b) **Right first time** is another idea which holds that a product should not have to be corrected once it is built. It is thus a corollary of the zero defects concept.

Crosby proposes four standards that flesh out these concepts.

(a) Quality is **conformance to requirements**.
(b) The system for advancing quality is **prevention**, not appraisal.
(c) The **goal** should be zero defects.
(d) The importance of quality is measured by the cost of *not* having quality.

Crosby's ideas demonstrate a fundamental shift from a 'supervisory' culture of quality assurance to one where each individual takes full responsibility for his work: **quality is everyone's responsibility**.

1.5 Juran

Joseph Juran's book *Quality Control Handbook* was published in 1951. He also worked with Japanese industrialists in the years immediately after World War II, and, with Deming, is credited with increasing Japan's industrial competitiveness.

While Deming's ideas are wide ranging and expand into considerations of leadership and management style, Juran was concerned with identifying **specific improvements for enhancing quality**. Juran's ideas are different in the following ways.

(a) The best approach to enhancing quality is to 'identify specific opportunities, evaluate their viability by using conventional methods such as return on investment, plan the selected project carefully, monitor their results'.

(b) Juran believes in the law of **diminishing returns**: there is an economic level of quality beyond which it is pointless to strive, because the costs outweigh the benefits.

(c) Juran believes that most quality problems derive from management systems and processes rather than poor workmanship.

Juran defines quality as 'fitness for use', which includes two elements.

(a) **Quality of design**, which can include the customer satisfactions built into the product.
(b) **Quality of conformance**, in other words a lack of defects in the finished goods.

1.6 Feigenbaum

Armand Feigenbaum appended the word 'total' to quality, thus emphasising the relevance of quality issues to **all areas of the operations of a business**. He is also noted for assessing the economic value of quality, as the value of many quality improvement measures are not exactly self-evident. In other words he stressed the importance of identifying the **costs** of quality, and the lack of quality, to prove that, in economic and accounting terms, 'prevention is better than cure'.

This involves changing the role of the quality control function (which inspected and rejected output) to one in which quality provided an effective system for quality maintenance.

(a) An **inspection role** is carried out after the event, after the wasteful and substandard production.

(b) A **planning role** would involve the design of systems and procedures to reduce the likelihood of sub-optimal production.

1.7 Ishikawa

The quality philosophy has been implemented most famously in Japan. According to some commentators **design quality** rather than **conformance quality**, has been responsible for much of the success of Japanese firms in some industries.

Ishikawa is noted for proposing **quality circles**, which are groups of selected workers delegated with the task of analysing the production process, and coming up with ideas to improve it. Success requires a commitment from the circle's membership, and a management willingness to take a back seat.

Quality circles are mainly management stimulated. Whatever the stated reasons are for instituting quality circles, the real reason for having quality circles is to motivate employees to improve quality.

2 Modern Japanese business practices and techniques

FAST FORWARD

Changes to the **competitive environment**, **product life cycles** and **customer requirements** have had a significant impact on the modern business environment.

2.1 Changing competitive environment

2.1.1 Management accounting and organisational culture

The relevance of organisational culture to management accounting can be explained in simple terms. The business of management accounting is to provide managers with information to help them run the business. **If the management accountant is not sensitive to the culture of his organisation he will not understand how it is run and will not know what sort of information to provide.** For example, a management accountant in a public sector organisation may need to focus on the effectiveness and efficiency of cost control, while a management accountant in a commercial entity may need to focus on how it is generating value for its shareholders.

Question — Management accounting and organisational culture

Robert Waterman (co-author with Tom Peters of the classic text *In Search of Excellence*) published a book entitled *The Frontiers of Excellence* (1994), which argued that leading companies at the time, and those that had been successful over long periods, did not put the shareholders first. Instead they concentrated on 'putting people first', the people in question being employees and customers.

How could a management accounting system foster such a culture, or undermine it?

Answer

A system to **foster** the 'people' culture would collect and analyse data about employee performance and customer reaction, provide the basis for rewards for what is good in these terms, and supply information that indicates to people how they could do better.

The culture would be **undermined** by a system that concentrates solely on reporting in figures and language aimed at the stock market.

Undoubtedly the most **profound influences** on Western corporate cultures since the 1990s have been ideas borrowed from **Japanese management**. 'Philosophies' such as Just-in-time (**JIT**) and Total Quality

Management (**TQM**) have a direct impact on business areas that have long been the preserve of accountants – purchasing and inventory control, quality costs, waste and scrap and so on.

Similarly, the Japanese **team working** approach is a radical change from the individualistic culture of the West, and this has further implications for performance measurement and reporting.

2.1.2 Organisations and the changing environment

In Chapter 3 we looked at how the changing competitive environment can affect organisations. These changes have meant that traditional management accounting techniques had lost their effectiveness. Consequently, management accountants have begun to adopt newer techniques that suit better the dynamism and changing cost structures of modern organisations.

In this chapter we look at some of the techniques and business practices developed in Japan. Some of this material may be familiar from your earlier studies. You must build on this knowledge to be able to **discuss** and **evaluate** these techniques in the exam.

2.2 Total quality management (TQM)

One of the most significant developments in performance management has been the emphasis on quality. And a key aspect of this has been a recognition of the **costs of quality**, which we will look at in this Chapter.

FAST FORWARD

In the context of **TQM**, quality means getting it right first time and improving continuously.

Key term

Total quality management (TQM) is the process of applying a zero defects philosophy to the management of all resources and relationships within an organisation as a means of developing and sustaining a culture of continuous improvement which focuses on meeting customers' expectations.

Mark Lee Inman listed 'eight requirements of quality' in an ACCA *Students' Newsletter* article, which could be seen as the **characteristics of total quality management programmes**.

(a) Organisation wide there must be acceptance that the only thing that matters is the **customer.**

(b) There should be recognition of the all-pervasive nature of the **customer-supplier relationship**, including internal customers; passing sub-standard material to another division is not satisfactory.

(c) Instead of relying on inspection to a predefined level of quality, **the cause of the defect** in the first place should be prevented.

(d) Each employee or group of employees must be **personally responsible** for defect-free production or service in their domain.

(e) There should be a move away from 'acceptable' quality levels**. Any level of defects must be unacceptable**.

(f) All departments should try obsessively to **get things right first time**; this applies to misdirected phone calls and typing errors as much as to production.

(g) **Quality certification programmes** should be introduced.

(h) The cost of poor quality should be emphasised; **good quality generates savings** (for example, through not having to re-work items with defects, or through a reduction in the level of refunds or replacement products given to customers).

Exam focus point

The examiner could ask you to discuss modern techniques such as TQM and how they could be applied in organisations, especially where they contrast with traditional management accounting techniques.

In the December 2008 exam, a part-question asked candidates to think about criteria for software to be considered **quality** software. Possible answers include building in quality and considering the costs of quality.

2.3 Just-in-time (JIT) systems

FAST FORWARD

JIT aims for zero inventory and perfect quality and operates by demand-pull. It consists of **JIT purchasing** and **JIT production** and results in lower investment requirements, space savings, greater customer satisfaction and increased flexibility.

Key terms

Just-in-time (JIT) is 'A system whose objective is to produce or to procure products or components as they are required by a customer or for use, rather than for inventory. A JIT system is a 'pull' system, which responds to demand, in contrast to a 'push' system, in which inventories act as buffers between the different elements of the system, such as purchasing, production and sales.'

Just-in-time production is 'A system which is driven by demand for finished products whereby each component on a production line is produced only when needed for the next stage'.

Just-in-time purchasing is 'A system in which material purchases are contracted so that the receipt and usage of material, to the maximum extent possible, coincide'.

Although often described as a technique, JIT is more of a **philosophy or approach to management** since it encompasses a **commitment to continuous improvement** and the **search for excellence** in the design and operation of the production management system.

In this respect, the aims of JIT are aligned with those of TQM, since both focus on eliminating waste and non-value added activities, and on producing goods which have zero defects.

Exam focus point

Part of a question in the December 2011 exam candidates to evaluate the effect that moving to Just-in-Time purchasing and production systems have on a company, and what impact they would have on the performance measures the company uses.

Quality and reliability are key elements of a successful JIT system, so it will be important for a company which uses a JIT system to introduce measures to assess how well it is performing in these areas if it does not already do so.

2.3.1 Essential elements of JIT

Exam focus point

Shane Johnson wrote an article on 'Just-in-time operations' in the April 2004 edition of *Student Accountant* magazine. The key points from the article are included in this section, but you are still advised to read the article in full.

Element	Detail
JIT purchasing	Parts and raw materials should be purchased as near as possible to the time they are needed, using small frequent deliveries against bulk contracts. Inventory levels are therefore minimised.
Close relationship with suppliers	In a JIT environment, the responsibility for the quality of goods lies with the supplier. A long-term commitment between supplier and customer should therefore be established. If an organisation has confidence that suppliers will deliver material of 100% quality, on time, so that there will be no rejects, returns and hence no consequent production delays, usage of materials can be matched with delivery of materials and inventories can be kept at near zero levels. However, flexibility and establishing good communication channels are also important aspects of the relationship with suppliers.
Uniform loading	All parts of the productive process should be operated at a speed which matches the rate at which the final product is demanded by the customer. Production runs will therefore be shorter and there will be smaller inventories of finished goods because output is being matched more closely to demand (and so storage costs will be reduced).

Element	Detail
Set-up time reduction	No value is added during set-up times; so set-ups are non-value-added activities. Consequently, time spent setting up machinery should be minimised.
Simplification	There is a constant focus on the simplification of products and processes in order to maximise the utilisation of available resources.
Machine cells	Machines or workers should be grouped by product or component instead of by the type of work performed. Products can flow from machine to machine without having to wait for the next stage of processing or returning to stores. Lead times and work in progress are thus reduced.
Quality	Production management should seek to eliminate scrap and defective units during production, and to avoid the need for reworking of units since this stops the flow of production and leads to late deliveries to customers. Product quality and production quality are important 'drivers' in a JIT system. Also, note the fundamental requirement in relation to quality is that the level of quality satisfies the customer.
Pull system (Kanban)	Products/components are only produced when needed by the next process. Nothing is produced in anticipation of need, to then remain in inventory, consuming resources.
Preventative maintenance	Production systems must be reliable and prompt, without unforeseen delays and breakdowns.
Employee involvement	Workers within each machine cell should be trained to operate each machine within that cell and to be able to perform routine preventative maintenance on the cell machines (ie to be multiskilled and flexible). Employee involvement in JIT programmes is also important at a more general level. The successful operation of JIT requires workers to possess a flexibility of both attitude and aptitude.

Case Study

The following extract from an article in the *Financial Times* illustrates how 'just-in-time' some manufacturing processes can be. The emphasis is BPP's.

'Just-in-time manufacturing is down to a fine art at *Nissan Motor Manufacturing (UK).* **Stockholding of some components is just ten minutes** – and the holding of all parts bought in Europe is less than a day.

Nissan has moved beyond just-in-time to **synchronous supply** for some components, which means manufacturers deliver these components directly to the production line minutes before they are needed.

These manufacturers do not even receive an order to make a component until the car for which it is intended has started along the final assembly line. Seat manufacturer *Ikeda Hoover*, for example, has about 45 minutes to build seats to specification and deliver them to the assembly line a mile away. It delivers 12 sets of seats every 20 minutes and they are mounted in the right order on an overhead conveyor ready for fitting to the right car.

Nissan has **close relationships with this dozen or so suppliers** and deals exclusively with them in their component areas. It involves them and even their own suppliers in discussions about future needs and other issues. These companies have generally established their own manufacturing units close to the Nissan plant.

Other parts from further afield are collected from manufacturers by *Nissan* several times at fixed times. This is more efficient than having each supplier making individual haulage arrangements.'

2.3.2 Problems associated with JIT

JIT should not be seen as a panacea for all the endemic problems associated with Western manufacturing. It might not even be appropriate in all circumstances.

(a) It is **not always easy to predict patterns of demand**.

(b) JIT makes the organisation **far more vulnerable to disruptions in the supply chain** (as the disruption to air freight in the aftermath of the volcanic eruption of Eyjafjallajokull in Iceland demonstrated)

(c) JIT, originated by Toyota, was designed at a time when all of Toyota's manufacturing was done within a 50 km radius of its headquarters. Wide geographical spread, however, makes this difficult.

Case Studies

JIT and supply chains

Following the Eyjafjallajokull volcanic eruption in Iceland in April 2010 a number of flights across Europe were cancelled because airline companies were concerned about the potential impact of the volcanic ash on the engines of their planes.

This flight ban, in turn, threatened to force worldwide car production to grind to a halt, as manufacturers were unable to source key electronic components.

The flight disruption highlighted the car industry's dependence on complex, worldwide supply chains that need multiple modes of transport to deliver goods and components just in time, to where they are needed.

Although air freight accounts for a tiny amount of world trade by weight - about 0.5 per cent for the UK - the disruption has highlighted how it plays a vital role in supplying key, high-value components to many manufacturers. In spite of its tiny volume, it accounts for 25 per cent of UK trade by value.

Among the carmakers, BMW and Nissan said they planned to suspend some production because of disruption to supplies. Audi said it might have to cancel shifts because of missing parts.

Although all three mainly use suppliers based near their factories and use road and sea for most deliveries, they depend on air freight for a small number of high-value electronic components. Nissan UK, for example, said it might have to halt production of its Cube, Murano SUV and Rogue crossover models because it lacked supplies of a critical sensor made in Ireland.

Although some components could be transported by sea freight (instead of air freight) this is a much slower means of transport, and so would lead to a delay in the components becoming available.

Some commentators have questioned whether this disruption will make companies re-examine their arrangements for sourcing goods. Companies have become more vulnerable to disruption since moving to just-in-time production methods, where hardly any inventory of products is held.

On the other hand, it would makes little sense to carry large quantities of excess inventory given the very slim chance of further severe disruption of this kind. Carrying excess inventory is a cost in itself.

However, there is an argument that companies should set up supply chains that reduce their reliance on a single mode of transport, and could be adapted to meet different circumstances. As Emma Scott from the Chartered Institute of Purchasing & Supply in the UK commended "It's a case of taking a sensible approach and having a flexible approach to your supply chain."

Adapted from article 'Pressure grows on supply chains'
Financial Times, 21 April, 2010

2.3.3 Modern versus traditional inventory control systems

There is no reason for the newer approaches to supersede the old entirely. A restaurant, for example, might find it preferable to use the traditional economic order quantity approach for staple non-perishable food inventories, but adopt JIT for perishable and 'exotic' items. In a hospital a stock-out could, quite literally, be fatal, and JIT would be quite unsuitable.

2.3.4 Costing implications of JIT

In his article *in Student Accountant* (April 2004, *Just-in-time operations*) Shane Johnson highlighted the costing implications of JIT.

'Just-in-time manufacturing enables purchasing, production, and sales to occur in quick succession with inventory being maintained at minimum levels. The absence of inventory renders decisions regarding cost-flow assumptions (such as weighted average or first-in, first-out) or inventory costing methods (such as absorption or marginal costing) unimportant. This is because all of the manufacturing costs attributable to a period flow directly into cost of goods sold. Job costing is simplified by the rapid conversion of direct materials into finished goods that are then sold immediately.'

The article also stresses that, while minimising costs will always remain an important consideration for businesses, the focus is no longer simply on minimising costs but also on **value appreciation**. This has important implications for performance measurement and performance management. Performance information can no longer simply look at costs, but financial and non-financial information will also be required looking at supplier performance, on-time deliveries, cycle times and the number of defective items manufactured.

2.4 Life cycle costing and target costing

FAST FORWARD

Life cycle costing assists in the planning and control of a product's life cycle costs by monitoring spending and commitments to spend during a product's life cycle.

2.4.1 What are life cycle costs?

Life cycle costs are incurred for products and services **from their design stage through development to market launch, production and sales, and their eventual withdrawal from the market**.

Traditional management accounting systems in general only report costs at the physical production stage of the life cycle and do not accumulate costs over the entire life cycle. They **assess a product's or project's profitability on a periodic basis**. Life cycle costing, on the other hand, considers a product's/project's entire life.

Key term

Life cycle costing tracks and accumulates actual costs and revenues attributable to each product or project over the entire product/project life cycle

The **total profitability** of any given product/project can therefore be determined.

Traditional management accounting systems usually total **all non-production costs** and record them as a **period expense**. **Using life cycle costing** such costs are **traced to individual products over complete life cycles.**

(a) The total of these costs for each individual product can therefore be reported and compared with revenues generated in the future.

(b) The visibility of such costs is increased.

(c) **Individual product profitability can be more fully understood** by attributing *all* costs to products.

(d) As a consequence, **more accurate feedback information** is available on the organisation's success or failure in developing new products. In today's competitive environment, where the ability to produce new and updated versions of products is paramount to the survival of an organisation, this information is vital.

2.4.2 The importance of the early stages of the life cycle

It is reported that some organisations operating within an advanced manufacturing technology (**AMT**) **environment** find that approximately **80-90% of a product's life cycle cost is determined by decisions made early within the cycle** at the design stage. Life cycle costing is therefore particularly suited to such organisations and products, monitoring spending and commitments to spend during the early stages of a product's life cycle.

In order to compete effectively in today's competitive market, organisations need to **redesign continually their products** with the result that **product life cycles** have become much **shorter**. The **planning, design and development stages of a product's cycle** are therefore **critical to an organisation's cost management process**. Cost reduction at this stage of a product's life cycle, rather than during the production process, is one of the most important ways of reducing product cost.

Here are some **examples of costs that are determined at the design stage.**

(a) The number of different components
(b) Whether the components are standard or not
(c) The ease of changing over tools
(d) Type of packaging

Case Study

The following case study illustrates the benefits of increasing the amount of standardisation in the car manufacturing process.

In August 2011, General Motors Co announced plans to become leaner in the future, cutting costs so it will make stronger profits.

GM said it plans to cut costs by halving the number of frames it bases its vehicles on across the globe. In 2010, GM had 30 frames, known in the industry as 'platforms'. By 2018 it plans to cut that number to 14. It will also sell more of the cars and trucks built on those platforms across the globe, saving on manufacturing, engineering and design costs. The company also plans to cut the number of engines it develops.

The Chairman and CEO, Dan Akerson noted, "There's a lot of complexity. We need to simplify it. More of our components will be common, and more of our vehicles will be built on global architectures."

GM said just 6 percent of its cars and trucks are currently (2011) built off of global platforms. The intention is that this figure should rise to 90 percent by 2018.

Japanese companies developed **target costing** as a response to the problem of **controlling and reducing costs over the product life cycle**.

2.4.3 Target costing

FAST FORWARD

Target costing is a pro-active cost control system. The target cost is calculated by deducting the target profit from a predetermined selling price based on customers' views. Techniques such as value analysis are used to change production methods and/or reduce expected costs so that the target cost is met.

Key term

Target cost is an estimate of a product cost which is derived by subtracting a desired profit margin from a competitive market price.

One of the key drivers in target costing is that once a target cost has been established, costs – in the design and manufacture of the product - have to be reduced to provide a product that can be made for the desired (target) cost.

'Target cost management has been defined as a system that is effective in managing costs in new-product design and development stages. It has also been viewed as allowing the production cost of a proposed product to be identified so that when sold it generates the desired profit level. ... Target cost management has also been viewed as playing a useful role in enabling an enterprise to set and support the attainment of cost levels to effectively reflect its planned financial performance. …What appears to be evident is that there are almost as **many conceptions of target costing** as there are companies deploying the approach and there are probably many **companies engaging in various aspects of target cost management without referring to the term**.

Target cost management has been posited to assist in the pursuit of product development time reduction, as well as the quality definition for a new product and cost containment generally. It has therefore been perceived as a managerial tool simultaneously to **address time, quality and cost issues**.'

(A Bhimani and H Okano, 'Targeting excellence: target cost management at Toyota in the UK', *Management Accounting,* June 1995 (with BPP's emphasis))

Case Study

Application of Target costing in the UK National Health Service (NHS)

Although target costing is often referred to in relation to products and manufacturing, it can also be applied to service industries. The following case highlights some of the issue involved in applying target costing to the NHS.

In the same way that the major part of product costs is determined at the design stage, the health service also has to design care pathways that focus on delivering care at an affordable level of cost. Therefore cost management needs to start early in the health care process just as it does in a manufacturing process.

Although the process of health care is about more than just cost control (and clearly it is important to focus on patients as well as costs) target costing can be very useful to help health services assess the costs of products or services before they are introduced.

And although the NHS is not (yet) driven by margins and financial returns in the same way that commercial organisations are, there are still questions about the extent to which primary care trusts within the NHS can afford to introduce new treatments.

In practice, some new treatments have been introduced irrespective of the question of affordability; for example based on recommendation by NICE (The National Institute for Health and Clinical Excellence).

The example of the breast cancer drug – herceptin – highlights the issue here. NICE has recommended that the drug should be made available on the NHS for women in the early stages of the disease, because it has been proved to reduce recurrence of the disease and increase life expectancy. However, herceptin is very expensive, and many primary care trusts will find it hard to afford a drug that costs around £20,000 a year per patient.

The primary care trusts might question whether NICE has considered the financial implications of their proposals, and whether it is financially viable for them to provide such an expensive drug.

However, target costing could also be used in more basic healthcare services. For example, it could be used to reduce the time patients spend in an operating theatre, or to assess whether intravenous antibiotics could not be administered orally instead. In essence, the practice of target costing would encourage a more detailed analysis of hospital practice to try to identify efficiencies in every area of the treatment process.

This can also include support areas such as procurement, encouraging managers to question the price paid for every component of the treatment, and to ask whether better deals could be struck.

Nonetheless, it is important to remember that target costing does also focus on the customer; in this case, the patient. So applying it to the NHS will not simply be about reducing costs, but about reducing costs whilst still delivering acceptable levels of patient care.

(Based on, and adapted from, '*Targeting Cost*' – an article by Simon Wombwell; October 2005, produced as part of a CIMA discussion group on Target costing and the NHS).

Question

Target costing

Can you see any problems with adopting target costing as a tool in a not-for-profit organisation?

Answer

Target costing can lead to **increased pressure on the workforce** as cost targets can be demanding and require a reduction in times taken to do jobs. This can be more difficult to achieve in the not-for-profit sector where employees can be the largest cost, and they are often the means of delivering the services. Over time savings become increasingly difficult to achieve.

Target costing requires managers to change the way they think about the relationship between cost, price and profit.

(a) The **traditional approach** is to **develop a product, determine the expected standard production cost** of that product and **then set a selling price** (probably based on cost) with a resulting profit or loss. Costs are controlled through variance analysis at monthly intervals.

(b) The **target costing approach** is to develop a **product concept** and the primary specifications for performance and design and then to **determine the price customers would be willing to pay** for that concept. The **desired profit margin is deducted from the price leaving a figure that represents total cost**. This is the target cost and the product must be capable of being produced for this amount otherwise the product will not be manufactured. **During the product's life the target cost will constantly be reduced** so that the **price can fall**. **Continuous cost reduction techniques** must therefore be employed.

2.4.4 The target costing process

Step 1 **Analyse the external environment** to ascertain what customers require and what competitors are producing. Determine the **product concept**, the price customers will be willing to pay and thus the **target cost**.

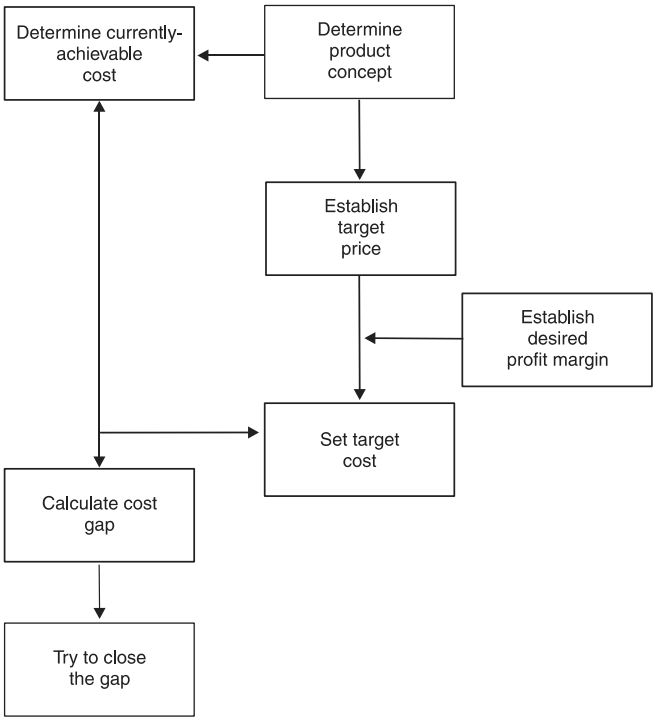
Step 2 **Split the total target cost into broad cost categories** such as development, marketing, manufacturing and so on. **Then split up the manufacturing target cost per unit across the different functional areas of the product. Design the product so that each functional product area can be made within the target cost.** If a functional product area cannot be made within the target cost, so that a **cost gap** exists between the currently achievable cost and the target cost, the targets for the other areas must be reduced, or the product redesigned or scrapped. The product should be developed in an atmosphere of **continuous improvement** using **value engineering techniques** and **close collaboration with suppliers**, to enhance the product (in terms of service, quality, durability and so on) and reduce costs.

Key term

Value engineering aims to help design products which meet customer requirements at the lowest cost while assuring the required standards of quality and reliability are maintained.

Step 3 Once it is decided that it is feasible to meet the total target cost, **detailed cost sheets** will be prepared and **processes formalised**.

The target costing process



2.4.5 Attaining the target cost

It is possible that management may decide to go ahead and manufacture a product whose target cost is well below the currently attainable cost (so that there is a **cost gap**), the currently attainable cost being determined by current technology and processes. If this is the case management will **set benchmarks for improvement** towards the target costs, by specified dates.

Options available to reduce costs

(a) **Training** staff in more efficient techniques
(b) Using **cheaper staff**
(c) Acquiring new, more **efficient technology**
(d) Cutting out **non-value-added activities**

Even if the product can be produced within the target cost the story does not end there. **Once the product goes into production target costs will gradually be reduced**. These reductions will be incorporated into the budgeting process. This means that cost savings must be actively sought and made continuously. Value analysis will be used to reduce costs if and when targets are missed.

Key term

Value analysis involves examining the factors which affect the cost of a product or service, so as to devise ways of achieving the intended purpose most economically at the required standards of quality and reliability.

Question

Standard costing v target costing

Fill in the blank spaces ((a) to (d)) in the table below to show how standard costing and target costing differ.

Stage in product lifecycle	Standard costing approach	Target costing approach
Product concept stage	No action	(a)
Design stage	(b)	Keep costs to a minimum
Production stage	Costs are controlled using variance analysis	(c)
Remainder of life	(d)	Target cost reduced, perhaps monthly

Answer

(a) Set the selling price and required profit and determine the resulting target cost
(b) Set standard cost and a resulting standard price
(c) Constant cost reduction
(d) Standards usually revised annually

2.5 Kaizen costing

Key term

Kaizen costing focuses on obtaining small incremental cost reductions during the production stage of the product life cycle.

Kaizen costing has been used by some Japanese firms for over twenty years and is now widely used in the electronics and automobile industries, for example. 'Kaizen' translates as **continuous improvement**.

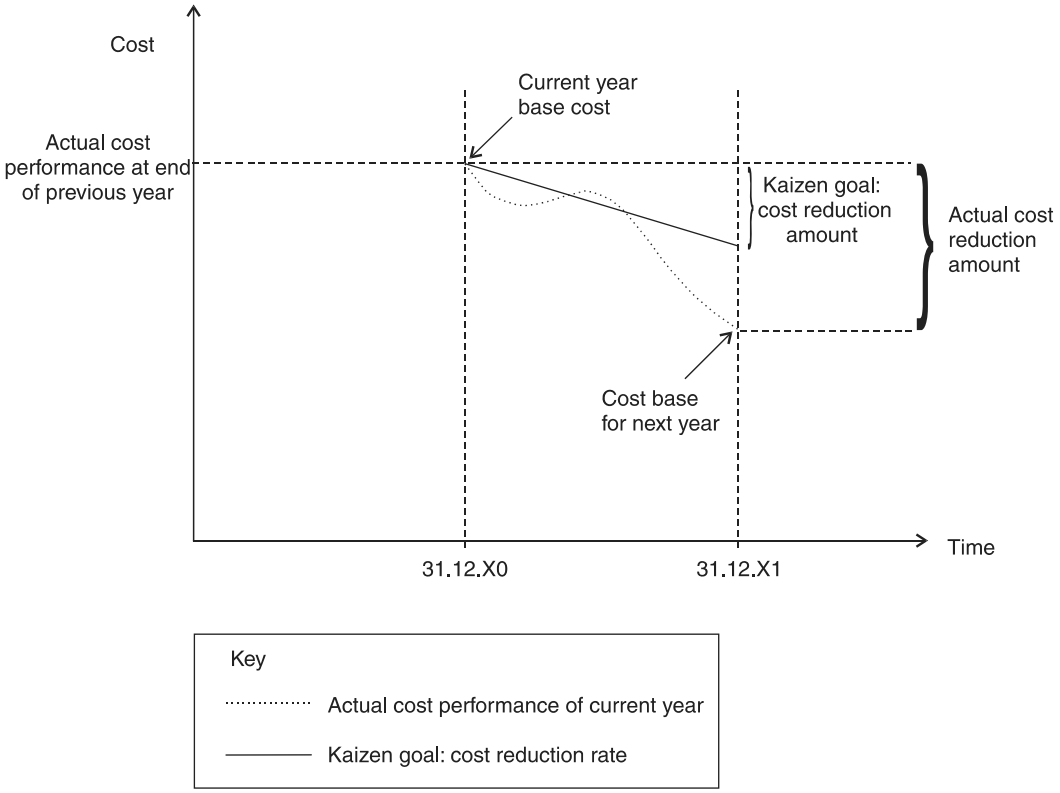
FAST FORWARD

The aim of **Kaizen costing** is to reduce current costs by using various tools such as value analysis and functional analysis.

2.5.1 The kaizen costing process

Functional analysis is applied at the design stage of a new product, and a **target cost for each function** is set. The functional target costs are added together and the total becomes the **product target cost**. Once the product has been in production for a year, the **actual cost of the first year becomes the starting point for further cost reduction**. It is this **process of continuous improvement, encouraging constant reductions by tightening the 'standards'**, that is known as kaizen costing.

The following Kaizen costing chart is based on one used at Daihatsu, the Japanese car manufacturer owned in part by Toyota, and reported in Monden and Lee's 'How a Japanese Auto Maker Reduced Costs' *(Management Accounting* (US Version), 2002).



The previous year's actual production cost serves as the cost base for the current year's production cost. A reduction rate and reduction amount are set (**Kaizen cost goals**). **Actual performance** is **compared** to the **Kaizen goals** throughout the year and **variances are monitored**. At the end of the current year, the current actual cost becomes the cost base for the next year. New (lower) Kaizen goals are set and the whole process starts again.

2.5.2 Kaizen costing v standard costing

Standard costing is used in conjunction with management by exception (management's attention is directed towards situations where actual results differ from expected results). The expected results are based on standards which have been derived from the capability of current organisational processes. **Standard costing** therefore **reflects current levels of performance** and **fails to provide any motivation to improve**.

The following table sets out the **principal differences between Kaizen costing and standard costing techniques**.

	Standard costing	Kaizen costing
Concepts	It is used for cost **control**. It is assumed that current manufacturing conditions remain unchanged. The cost focus is on standard costs based on static conditions. The aim is to meet cost performance standards.	It is used for cost **reduction**. It assumes **continuous improvement**. The cost focus is on actual costs assuming dynamic conditions. The aim is to achieve cost reduction targets.
Techniques	Standards are set every six or twelve months. Costs are controlled using variance analysis based on standard and actual costs. Management should investigate and respond when standards are not met.	Cost reduction targets are set and applied monthly. Costs are reduced by implementing **continuous improvement** (kaizen) to attain the target profit or to reduce the gap between target and estimated profit. Management should investigate and respond when target kaizen amounts are not attained.
Employees	They are often viewed as the **cause of problems**.	They are viewed as the **source of**, and are empowered to find, the **solutions**.

(Adapted from Monden and Lee)

Exam focus point

One of the questions in the December 2011 exam picked up on the contrast between Kaizen costing and standard costing approaches. The question scenario highlighted that a company's existing performance reporting system used a standard costing approach, but that the management planned to improve financial performance through the use of Kaizen costing and just-in-time purchasing and production.

Candidates were then asked to discuss and evaluate the impact the Kaizen costing approach would have on the costing system and on employee management in the company.

In effect, the question was asking candidates to highlight the contrast between traditional costing systems which focus on cost control (against standard, fixed targets), and Kaizen costing systems which focus on cost reduction and performance improvement.

It is also important to note the impact of the change in systems has on employees and employee management.

A standard costing system doesn't provide any motivation to improve performance levels, but the whole focus of kaizen costing is on performance improvement. And crucially, instead of being seen as the cause of problems, as they are in traditional systems, employees will be seen as the source of solutions under a kaizen system, and they will be empowered to find, and then implement, those solutions. This, in turn, should help increase staff motivation.

2.5.3 How are Kaizen goals met?

(a) Reduction of non-value added activities and costs
(b) Elimination of waste
(c) Improvements in production cycle time

2.6 Continuous improvement

FAST FORWARD

The essence of **continuous improvement** is the use of an organisation's human resources to produce a constant stream of improvements in all aspects of customer value, including quality, functional design, and timely delivery, while lowering cost at the same time.

In today's highly competitive environment, performance against static historical standards is no longer appropriate and successful organisations must be **open to change** if they are to **maintain their business advantage**. Being **forward looking** and **receptive to new ideas** are **essential elements of continuous improvement**. The concept was popularised in Japan, where it is known as kaizen, and many of Japan's economic advances over the past 20 years have been attributed to it.

Key term

> **Continuous improvement** is an 'ongoing process that involves a continuous search to reduce costs, eliminate waste, and improve the quality and performance of activities that increase customer value or satisfaction'. Drury, *Management and Cost Accounting*

The implementation of continuous improvement does not necessarily call for significant investment, but it does require a great deal of **commitment and continuous effort**.

Continuous improvement is often associated with **incremental changes** in the day-to-day process of work **suggested by employees** themselves. This is not to say that continuous improvement organisations do not engage in radical change. **Quantum leaps in performance** can occur when cumulative improvements synergise, the sum of a number of small improvements causing a profound net effect greater than the sum of all the small improvements.

However, because the improvements are continuous they are, by definition, **ongoing**. The process must never stop and sustained success is more likely in organisations which regularly review their business methods and processes in the drive for improvement.

Case Study

Continuous improvement at Corus

The steel manufacturing company Corus is a subsidiary of Tata Steel, part of the giant Indian conglomerate, Tata Group. Corus' principle manufacturing site is at Scunthorpe, where is employs about 5,500 people, and produces over 4 million tonnes of steel products each year. Producing large volumes helps to drive down the costs of producing the steel, so this results in steel being a relatively inexpensive product.

Corus' business strategy is to produce quality steel to satisfy customer requirements, focusing on delivering products at the right time in order to secure profitable business. One of the key challenges it faces is meeting the increasing demands for more steel, at increasing levels of quality and to comply with more demanding delivery requirements.

Corus could meet these challenges by moving to brand new facilities. However, a new 'greenfield site' steel mill could cost more than £300 million to build. Instead, therefore, Corus needs to make process efficiencies and to achieve quality and delivery improvements within its existing manufacturing plant, and it has sought to do this through the process of continuous improvement.

One of the key issues in continuous improvement is reducing or eliminating waste, and Corus has been looking to reduce waste in its steel plate manufacturing process, and the concept of 'flow' has been vital in doing this. It has meant that products are 'pulled' through the process according to customer demand. All parts of the production process, from the supply of raw steel to the finished steel plate, are carefully planned.

Scheduling for each element of the process ensures that bottlenecks are kept to a minimum. Each process is paced to control the amount of product in each stage of the process. This ensures that processes operate smoothly without overload or delay and keep the desired output and quality.

Traditionally, the key measure of productivity at Corus was tonnage (output). So for employees to work to a smooth-paced process (rather than simply trying to maximise output) needed a significant culture change.

Continuous involvement requires team work, and at Corus' Scunthorpe plant a manager coordinates the process. 40 Continuous improvement coaches (chosen from the workforce) received training to facilitate the improvement process.

Corus has put together a 'toolbox' of techniques which the coaches use with managers, employees and operators. These help everyone understand where and how they can improve their work. A continuous improvement culture means that everyone can put forward ideas and have a say in how processes can change for the better. This is known as engagement.

An organisation needs to know where it is going in order to be able to put in place the resources it needs to achieve its plans. This is set out in its vision.

Corus' Scunthorpe plate mill has set out a 5-year vision improvement plan which will help in the process of developing a continuous improvement culture for the business. Everyone in the organisation has to understand and actively support the plan. Workshops for all employees have taken place, to explain the vision and why the change is necessary to enable Corus to remain competitive.

Helped by the continuous improvement coaches, workers have drawn maps of their processes. These show the links between the stages of manufacturing as well as what information flow is needed. The maps show: details of tonnages; numbers of products; rework cycles; inspection points; inventories; delays; and costs.

The first part of the continuous improvement process has been to draw up a 'current state value stream map'. This shows what the systems and processes are like now. The next stage considers what the 'future state map' would look like. This highlights what Corus needs to do to achieve the desired future state, for example, investing in new processes, equipment or additional staffing.

The Scunthorpe plate mill has 16 system maps. These link to each other to give an overview of the whole process. For each of the 16 systems, there are a number of rules about inventory levels and inventory rotation to ensure that the mill is properly pace and all 'downstream' processes (such as cutting, levelling and inspection) can be scheduled accordingly.

Using the value stream maps, Corus has been able to improve process flows and the working environment. It has also reduced unnecessary motion, transport and processing. By taking these small steps and involving everyone in the vision, the delivery of product has increased from 70% of plates on time to 92% on time.

Target setting

Implementing a continuous improvement process also requires everyone to think differently about the way they work. Corus recognised that people might be resistant to change and cling on to old ways of working. The key was getting all workers to see change as their responsibility.

The continuous improvement coaches support the teams and individual staff, and promote or 'champion' new ways of working. Over time, the team and individuals are empowered to take on responsibility and make decisions for themselves. To help workers accept the changes, the 5-year plan established a timeline for the programme of introducing change.

An important part of Corus' continuous improvement programme was the creation of key performance indicators (KPIs).

As we have noted above, historically performance measures at Corus were largely based on tonnes of steel rolled. However, these measures did not show whether the steel met customers' needs or whether the steel needed rework because it didn't meet customer requirements.

Consequently, Corus has now set new KPIs which focus on meeting customer deadlines, such as:

- A zero backlog of customer orders - this means customers always get their deliveries on time
- Meeting targets for rolling steel plate in its allotted week

Corus also monitors and measures how its operations compare with other producers and competitors in the steel industry, through a process of benchmarking. And Corus has also encouraged information sharing throughout the business to help drive improvement.

Costs and benefits of continuous improvement

Corus incurred significant costs in setting up a continuous improvement programme, including:

- Allocating employee time to participate in group work
- Training coaches
- Setting up a manual of tools and techniques.

However, it is now seeing the benefits of continuous improvement, including:

- Reduced waste through lean production
- Improved product quality
- Reduced re-work time
- Faster response times, giving more customers their orders on time
- Becoming more competitive by driving down costs
- Retaining/gaining customers through innovative products and services.

KPIs show that the Scunthorpe mill is now delivering almost 100% of customers' orders complete and on time.

The principles of team working have helped to create a more flexible workforce. This gives Corus the capacity to increase or change production when necessary. In addition, Corus employees are more likely to be satisfied and motivated with their jobs when they feel that they are making a contribution. They can see their expertise helps to create a more effective company. By empowering its workers, Corus gains a more committed workforce which helps to drive further improvement, and will hopefully allow Corus to out-perform its competitors .

Based on article 'Continuous improvement as a business strategy' in *The Times 100*; www.thetimes100.co.uk

2.6.1 Essential factors for continuous improvement

(a) Total **commitment from senior management**

(b) The **opportunity for all employees to contribute** to the continuous improvement process. Tactical and operational level staff, rather than senior management, usually have the information required. The most successful continuous improvement programs are the ones that have the highest staff involvement.

(c) Good, objective **information about the organisation's environment** so that its outcomes (what it does) and its processes (how it does it) can be evaluated

(d) **Employees' awareness of their role** in the achievement of the organisation's strategy

(e) **Management of the performance and contribution of employees**

(f) **Good communications** throughout the organisation

(g) Implementation of **recognised quality management systems and standards**

(h) **Measurement and evaluation of progress against key performance indicators and benchmarks**. Some organisations have found that simply displaying productivity and quality data every day or week raises production and quality because staff can tell when they are doing things right, and so find themselves in a personal continuous improvement cycle.

It is claimed that if these areas are regularly **reviewed**, change can be managed effectively and **continuous improvement becomes a natural part of the organisational processes**. It should create steady growth and development by keeping the organisation focused on its aims, priorities and performance.

2.6.2 Quality circles

A quality circle consists of a **group of employees**, often from different areas of the organisation, who meet regularly to **discuss problems of quality and quality control** in their area of work, and perhaps to suggest

ways of improving quality. It is also a way to **encourage innovation**. The aim of quality circles is to **improve employee development and morale** so as to create a **sense of ownership of the quality** of products and services.

Teamwork, in the form of quality circles and **group problem-solving activities**, is the cornerstone of continuous improvement.

2.6.3 Benefits of continuous improvement

(a) Better performance, which produces increased profits
(b) Improvements in customer satisfaction
(c) Increases in staff morale
(d) Improvement on a continual, step-by-step basis is more prudent than changing things all at once
(e) Better communication within the organisation
(f) Improvements in relations with suppliers
(g) Better use of resources
(h) More efficient planning

Case Studies

The continuous improvement process has been implemented to a wide range of organisations in a variety of sectors, as illustrated by the following case studies. The emphasis is BPP's.

(a) Volex is a leading provider of power cords and power products. The following extract is taken from the Volex Group plc's website and is fairly typical of the way in which organisations are keen to demonstrate their commitment to continuous improvement.

'Volex is committed to a program of Continuous Improvement across all its operations. All improvement projects have a **specific customer focus** and are based on **measured progress against firm targets or industry benchmarks**. We also encourage the **active involvement of our employees**. Many sites operate Kaizen schemes with cross-functional project teams applying working-level improvement actions on many topics including environmental, health and safety programs.

At Volex, Continuous Improvement is considered a **crucial process to achieve competitive advantage for our customers and ourselves**. We accord high management priority to key product and service-level improvement projects. Programs that integrate the results using international models of performance improvement are then used to set senior management performance targets for subsequent years.

The process of improvement links closely with personal development. Volex is strongly committed to the training and development of its employees worldwide. Through our knowledge, skills and experience, we help ensure the success of our customers' projects around the world every day.'

(b) The Charter Mark is a well-established government award scheme in the UK promoting and recognising public sector excellence in customer service. **Continuous improvement** is a **key principle** of the **Charter Mark award**. The principle requires that organisations continually look for ways to improve their services and the facilities they offer. They do this by:

(i) Promoting innovation, creativity and striving for excellence.
(ii) Recognising that, no matter how good, service can always improve.
(iii) Adopting the latest technologies to change the way business is done.

(c) Chrysler's Five Star Dealer Incentive Program (which ran from 1997-2010) was designed for 'improving or creating processes to quickly find what creates customer dissatisfaction and find ways to fix these issues'. The first step for dealers was to contact their customers to get feedback on their sales or service experience. The use of this feedback was mandatory, as getting information and not using it is seen to lower trust, increase frustration and cost money. Dealers were required to put in place processes that not only resolve customer problems but also allow them to learn from them. This is a **hallmark of continuous improvement: collecting information**

at every opportunity and putting it to use. Dealers were also required to provide training for staff who deal with customers, as efforts to make change are seen to be constrained unless all staff understand not only that they can have an effect, but that they are expected to have an effect.

In theory, this programme should have been extremely powerful, but **in practice it had some problems**. Employees were under a lot of pressure to get survey ratings up. However, many of the issues which annoyed customers were not under their control. In addition, mechanics were still under a great deal of pressure to push jobs through quickly, and not waste time talking to each other, sharing lessons learned. Moreover, the desire to get customers' cars back on time may cause 'fix-it-fast' problems, although the programme's emphasis seemed to be on fixing things right the first time.

In 2010, Chrysler replaced its Five Star program with a new program called Dealer Standards. The program is administered by an external company which handles similar duties for Fiat. Dealerships are graded on a variety of categories, including customer relations and facilities, although sales volume is now a major factor.

2.7 Costs of quality and cost of quality reports

FAST FORWARD

Costs of quality can be analysed into **prevention, appraisal, internal failure** and **external failure** costs and should be detailed in a cost of quality report.

When we talk about quality-related costs you should remember that a concern for **good quality saves money**; it is **poor quality that costs money.**

Cost of quality reports highlight the total cost to an organisation of producing products or services that do not conform with quality requirements. Four categories of cost should be reported:

(a) Prevention costs
(b) Appraisal costs
(c) Internal failure
(d) External failure

Exam focus point

Costs of quality were tested in the December 2008 exam, in an eight-mark part-question. Candidates were asked to identify the four categories of quality cost and give examples of each.

Make sure you know what the four categories are, but equally be prepared to assess how they could affect an organisation's performance.

Key term

The **cost of quality** is 'The difference between the actual cost of producing, selling and supporting products or services and the equivalent costs if there were no failures during production or usage'.

The cost of quality can be analysed into the following.

- **Cost of prevention –** costs incurred prior to or during production in order to prevent substandard or defective products or services from being produced
- **Cost of appraisal –** costs incurred in order to ensure that outputs produced meet required quality standards
- **Cost of internal failure –** costs incurred as a result of outputs not meeting required quality standards, but where these deficiencies are identified before the products or services are transferred from the supplier to the purchaser
- **Cost of external failure –** costs resulting from outputs not meeting required quality standards, but where there deficiencies are only identified after the products or services have been transferred from the supplier to the purchaser.

Note that the first three 'costs' (prevention; appraisal; internal failure) are all **internal** to an organisation: for example, the inspections and analysis take place within the organisation before a product leaves the factory.

However, the fourth cost (external failure) only occurs once a product leaves the factory, and the quality problems or issues are identified by the **customer**.

Quality-related cost	Example
Prevention costs	Quality engineering Design/development of quality control/inspection equipment Maintenance of quality control/inspection equipment Administration of quality control Training in quality control
Appraisal costs	Acceptance testing Inspection of goods inwards Inspection costs of in-house processing Performance testing
Internal failure costs	Failure analysis Re-inspection costs Losses from failure of purchased items Losses due to lower selling prices for sub-quality goods Costs of reviewing product specifications after failures
External failure costs	Administration of customer complaints section Costs of customer service section Product liability costs Cost of repairing products returned from customers Cost of replacing items due to sub-standard products/marketing errors

2.8 Views on quality costs

2.8.1 View one – the traditional view

Key terms

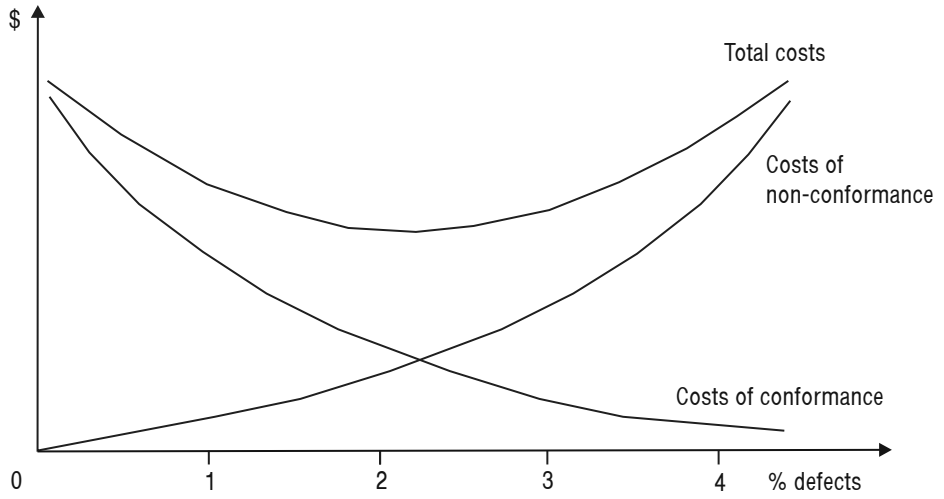
Cost of conformance is 'The cost of achieving specified quality standards'.

Cost of non-conformance is 'The cost of failure to deliver the required standard of quality'.

The **cost of conformance** is a **discretionary** cost which is incurred with the intention of **eliminating the costs of internal and external failure.**

The **cost of non-conformance**, on the other hand, can **only be reduced by increasing the cost of conformance**.

The **optimal investment in conformance costs** is when **total costs of quality reach a minimum** (which may be below 100% quality conformance). This is illustrated in the following diagram.



To ac eve **0% defects, costs of conformance must be high**. For example, if every single item that comes off a production line in a factory is subjected to a detailed quality check before it leaves the factory, this should lead to a very low level of defects, but it will mean the costs of conformance are high. As a greater proportion of defects are accepted, however, the costs of conformance costs can be reduced; for example, if only a sample of the items coming off the production line are checked this will reduce the time (and cost) spent on checking.

At a level of **0% defects, costs of non-conformance** should be **nil (**because there are no defects to remedy) but the costs of non-conformance will increase as the accepted level of defects rises**.** There should therefore be an **acceptable level of defects** at which the **total costs of quality are at a minimum**.

2.8.2 View two – TQM philosophy

A 'traditional' approach to quality management (view one above) is that there is an **optimal level of quality effort, that minimises total quality costs**, and there is a point beyond which spending more on quality yields a benefit that is less than the additional cost incurred. Diminishing returns set in beyond the optimal quality level.

The **TQM philosophy** is different.

(a) Failure and poor quality are unacceptable. It is **inappropriate to think of an optimal level of quality** at which some failures will occur, and the **inevitability of errors is not something that an organisation should accept**. The target should be zero defects.

(b) Quality costs are difficult to measure, and failure costs in particular are often seriously under estimated. The **real costs of failure include** not just the cost of scrapped items and re-working faulty items, but also the **management time spent sorting out problems** and the **loss of confidence** between different parts of the organisation whenever faults occur.

(c) A TQM approach does not accept that the prevention costs of achieving zero defects becomes unacceptably high as the quality standard improves and goes above a certain level. In other words, **diminishing returns do not necessarily set in**. If everyone in the organisation is involved in improving quality, the cost of continuous improvement need not be high.

(d) If an organisation **accepts an optimal quality level** that it believes will minimise total quality costs, there will be **no further challenge** to management to improve quality further.

The **TQM quality cost model** is based on the view that:

(a) **Prevention costs and appraisal costs** are **subject to management influence** or control. It is **better to spend money on prevention**, before failures occur, than on inspection to detect failures after they have happened.

(b) **Internal failure costs and external failure costs** are the **consequences of the efforts spent on prevention and appraisal**. Extra effort on prevention will reduce internal failure costs and this in turn will have a knock-on effect, reducing external failure costs as well.

In other words, **higher spending on prevention will eventually lead to lower total quality costs**, because appraisal costs, internal failure costs and external failure costs will all be reduced. The emphasis should be on 'getting things right first time' and 'designing in quality' to the product or service.

2.9 Cost of quality reports

Shown below is a typical cost of quality report. **Some figures** in the report, such as the contribution forgone due to sales lost because of poor quality, may have to be **estimated,** but it is better to include an estimate rather than omit the category from the report.

The report has the following **uses**.

(a) By expressing each cost category as a percentage of sales revenue, **comparisons** can be made with previous periods, divisions within the group or other organisations, thereby highlighting problem areas. A comparison of the proportion of external failure costs to sales revenue with the figures for other organisations, for example, can provide some idea of the level of customer satisfaction.

(b) It can be used to make senior management aware of **how much is being spent** on quality-related costs.

(c) It can provide an indication of **how total quality costs could be reduced by a more sensible division of costs between the four categories.** For example, an increase in spending on prevention costs should reduce the costs of internal and external failure and hence reduce total spending.

COST OF QUALITY REPORT
YEAR ENDING 31 DECEMBER 20X0

	$'000	$'000	*Cost as % of annual revenue* ($10 million)
Prevention costs			
Design of quality control equipment	80		
Quality control training	80		
		160	1.6
Appraisal costs			
Inspection of goods inwards	90		
Inspection of WIP	100		
		190	1.9
Internal failure costs			
Scrap	150		
Rework	200		
		350	3.5
External failure costs			
Returns	500		
Contribution forgone on lost sales	400		
Handling customer complaints	100		
		1,000	10.0
		1,700	17.0

Although cost of quality reports provide a useful summary of the costs, effort and progress of quality, **non-financial quality measures** may be more appropriate for **lower levels of management**. Here are some examples of such measures.

(a) Number of customer complaints
(b) Number of warranty claims
(c) Number of defective units delivered to customers as a percentage of total units delivered

Question

Quality costs

LL designs and makes a single product, the X4, used in the telecommunications industry. The organisation has a goods received store which employs staff who carry out random checks to ensure materials are of the correct specification. In addition to the random checks, a standard allowance is made for failures due to faulty materials at the completion stage and the normal practice is to charge the cost of any remedial work required to the cost of production for the month. Once delivered to the customer, any faults discovered in the X4 during its warranty period become an expense of the customer support department.

At the end of each month, management reports are prepared for the Board of Directors. These identify the cost of running the stores and the number of issues, the cost of production and the number of units manufactured, and the cost of customer support.

Required

(a) Briefly discuss why the current accounting system fails to highlight the cost of quality.

(b) Identify four general categories (or classifications) of LL's activities where expenditure making up the explicit cost of quality will be found and provide an example of a cost found within each category.

(c) Give one example of a cost of quality not normally identified by the accounting system.

Answer

(a) **Failure of the current accounting system to highlight the cost of quality**

Traditionally, **the costs of scrapped units**, **wasted materials and reworking** have been **subsumed within the costs of production** by assigning the costs of an expected level of loss (a normal loss) to the costs of good production, while accounting for **other costs of poor quality** within **production or marketing overheads**. Such costs are therefore not only considered as **inevitable** but are not **highlighted** for management attention. Moreover, traditional accounting reports tend to **ignore the hidden but real costs of excessive inventory levels** (held to enable faulty material to be replaced without hindering production) and the facilities necessary for storing that **inventory**.

(b) **Explicit costs of quality**

There are four recognised categories of cost identifiable within an accounting system which make up the cost of quality.

(i) **Prevention costs** are the costs of any action taken to investigate, prevent or reduce the production of faulty output. Included within this category are the costs of training in quality control and the cost of the design/development and maintenance of quality control and inspection equipment.

(ii) **Appraisal costs** are the costs of assessing the actual quality achieved. Examples include the cost of the inspection of goods delivered and the cost of inspecting production during the manufacturing process.

(iii) **Internal failure costs** are the costs incurred by the organisation when production fails to meet the level of quality required. Such costs include losses due to lower selling prices for sub-quality goods, the costs of reviewing product specifications after failures and losses arising from the failure of purchased items.

(iv) **External failure costs** are the costs which arise outside the organisation (after the customer has received the product) due to failure to achieve the required level of quality. Included within this category are the costs of repairing products returned from customers, the cost of providing replacement items due to sub-standard products or marketing errors and the costs of a customer service department.

(c) **Quality costs not identified by the accounting system**

Quality costs which are not identified by the accounting system tend to be of two forms.

(i) Opportunity costs such as the loss of future sales to a customer dissatisfied with faulty goods.

(ii) Costs which tend to be subsumed within other account headings such as those costs which result from the disruption caused by stock-outs due to faulty purchases.

2.10 Quality systems documentation

TQM is a management philosophy. However, implementing TQM is not simply a matter of involving employees and encouraging a quality culture. There is also a need for systems and procedures for ensuring quality. Quality systems should be documented thoroughly.

(a) A company quality manual may summarise the quality management policy and system.

(b) A procedures manual sets out the functions, structures and responsibilities for quality in each department.

(c) Detailed work instructions and specifications for how work should be carried out show how to achieve the desired quality standards.

2.11 Adverse feedback on TQM

Although many organisations continue to implement TQM programmes, TQM is susceptible to various adverse perceptions:

(a) In practice, TQM initiatives are not introduced or implemented effectively, and the job is 'botched' by management.

(b) After obtaining short-term benefits from introducing TQM the benefits wear off over time, due to 'quality disillusionment'.

TQM programmes can also suffer from:

(a) A lack of top-management commitment.

(b) A failure to understand the full range of quality issues and quality costs.

(c) Vested interests and organisational politics.

(d) The slow speed of introducing new initiatives in an organisation, especially a large bureaucratic organisation.

(e) General cynicism about quality and fulfilling customer needs.

3 The terminology of quality management

FAST FORWARD

'Quality' does not mean 'high quality'. It is the degree to which a set of inherent characteristics fulfils requirements. **Quality control** satisfies quality requirements, while **quality assurance** gives confidence that quality requirements will be satisfied. That is, quality control is about activities such as supervision and measurement, while quality assurance is about things that make those activities effective, such as training and quality records.

The word **quality** is used in several ways in everyday speech: it is used most precisely to mean simply the **nature** of a thing or to refer to one of its specific **characteristics**. However, the word is also used, rather imprecisely, to indicate that a thing possesses a high degree of excellence or is of **good** quality, the word **good** being understood. Thus, if people speak of 'a quality product', we understand them to mean that the product is made to high standards and will give good service.

We must discard this everyday imprecision when we begin to consider quality in its more technical sense. This is because the real world of business has room for a **wide range of different products**, each providing a **different combination of price and relative quality**. People flying first class expect a greater degree of comfort and service than is provided to passengers in tourist class, and rightly so: they have paid a much higher fare. But this does not mean that tourist class passengers are not equally entitled to the proper level of service that they, in turn, have paid for. **Quality** does not mean 'the best': it means what is right and proper under the circumstances.

This concept of quality is adopted in the International Organisation for Standardisation (ISO) definition.

Key term

Quality is 'the degree to which a set of inherent characteristics fulfils requirements'. *ISO*

Exam focus point

The various ISO definitions given in this chapter are worth committing to memory. This is because questions on this part of the syllabus are likely to be quite practical and knowledge-based. A good definition is often an excellent way to start an answer to such a question (so long as it is relevant).

The ISO definition is a little open-ended, in that its full meaning depends on what the **requirements** are, but we can deal with that.

(a) In a **retail context**, we might suggest that those requirements are the same thing as **reasonable customer expectations**, bearing in mind that these will inevitably reflect the price paid, to some extent at least.

(b) Within the organisation or within a value system or network, the concept of the **internal customer** is relevant, and we may say that proper requirements reflect **fitness for purpose**, which must, in its turn, reflect the same reasonable expectations of the **strategic customer** (defined earlier in this study text). Here we might usefully introduce the concept of **design specification**, which should provide a clear specification of what is required.

(c) In a **not-for-profit** scenario, a similar concept applies, though we might speak of the reasonable expectations of the relevant **stakeholders**.

Exam focus point

While it is important to be aware of the different definitions relating to quality, it is equally important not to lose sight of *why* 'quality' is important for an organisation. For example:

'Costs' of quality will affect the organisation's profitability.

Quality (high quality) may be used as a differentiating factor by an organisation pursuing a differentiation strategy.

The quality of the goods or services that customers receive is likely to affect customer satisfaction, and in turn customer retention and revenues.

Ultimately, if the quality of an organisation's products or services regularly falls below the required standard, the organisation will not be able to survive, because customers will not want to buy products from it, or use its services.

An organisation will not be able to meet its strategic objectives consistently if doesn't have any control over the quality of the products or services it offers.

3.1 Managing quality

If an organisation is to deliver products and services of the necessary level of quality, it must actively manage all the factors that have an impact on quality. In fact, there are very few aspects of any organisation that can be regarded as having no influence on quality, so an effective **quality management system** (QMS) is likely to have complex ramifications. The International Organisation for Standardisation (ISO) definition of QMS is, perhaps, over-simplistic: 'a management system to direct and control an organisation with regard to quality'.

In their text *ISO 9001: 2000 In brief*, Tricker and Sherring-Lucas provide a more substantial definition of a quality management system:

Key term

> A **quality management system** is the organisational structure of responsibilities, activities, resources and events that together provide procedures and methods of implementation to ensure the capability of an organisation to meet quality requirements. *Tricker and Sherring-Lucas*

This definition gives a good indication of what is involved in a QMS. Much of it is present in organisations that do not claim to have a QMS as such: the difference is that the organisation that uses a QMS manages these common elements in a way that contribute to quality management. For example, any manufacturing organisation, no matter how rudimentary, will perform the activity of **procurement**. Procurement as part of a QMS will, for example, take positive steps to ensure that purchased materials conform consistently to the appropriate quality standards; non-QMS procurement may or may not do the same, but even if it does, it is unlikely that the procedures concerned will be documented and applied consistently.

The quality management system pervades the whole organisation since it is unlikely that there will be any of its aspects that do not have the potential to affect the quality of its outputs. Two very obvious features are the **quality manual** and the job of **quality manager**, but many other elements have their part to play. These include staff and management generally, customer requirements, supplier inputs, product design and development and customer service activities.

Quality management systems are discussed in more detail later in this chapter.

3.2 Quality assurance and quality control

Quality assurance (QA) and quality control (QC) are important aspects of the QMS.

Key terms

> **Quality assurance** is the 'part of quality management focussed on providing confidence that quality requirements will be fulfilled.'
>
> **Quality control** is the 'part of quality management focussed on fulfilling quality requirements'.
>
> *ISO 9000:2005*

These two definitions are worth thinking about, especially if you have fallen into the common habit of thinking that **quality assurance** is just a more up to date version of **quality control**.

Quality control is about the things the organisation has to do to be sure that the quality of its output is as it should be. It is about activities such supervision, inspection, checks and measurements and applies to all parts of the organisation's value chain.

If QC is about fulfilling quality requirements, it is clear from the definition of **quality assurance** that it is about providing confidence that all the necessary QC activities are operating as they should and that a proper level of quality is therefore being achieved. QA is therefore concerned with the things that make quality control systems and activities effective. These things include quality policies; relevant management and training; and documentation such as quality records.

Tricker and Sherring-Lucas say that the **purpose** of QA is twofold:

(a) To provide assurance to a customer that the standard of workmanship within a contractor's premises is of the desired level and that all products leaving that particular firm are at, or above, a certain fixed minimum level of specification

(b) To ensure that manufacturing and service standards are uniform between an organisation's departments or offices and that they remain constant despite changes in personnel.

Exam focus point

> You should be prepared to distinguish between the roles of quality, quality control and quality assurance in an organisation, and assess how each of these differing aspects can affect an organisation's performance.
>
> As preparation for your exam, ask yourself what role do quality, quality control and quality assurance play in an industry you are familiar with?

For example, an audit might be seen as a measure of quality control. It involves checking and reviewing work that has been done to ensure that pre-determined quality standards are being met. It involves the selection of sample items to be extracted and inspected.

Then contrast quality **control** (which is primarily about **detecting** errors) with quality **assurance** which is primarily concerned with **preventing** defective products, to be able to **guarantee the quality** of goods or services provided. How might this be achieved? For example, by having quality policies; setting quality targets; quality improvement initiatives (including new equipment or new software); or through staff training and management.

3.3 Quality certification

If an organisation's QMS is to provide a proper level of assurance to existing and potential customers, it is necessary for the organisation to achieve **quality certification**. This is an externally provided acknowledgement that the QMS is adequate in its provisions and its operation. Certification can only be provided by **accredited certification bodies**.

The fact that you are sitting this exam is an example of quality certification. As an accountant working in business or practice you will regularly provide advice to colleagues or clients. Your professional body (ACCA) needs to be sure that its members achieve the quality levels it expects, and it regulates this through the exams that you have to pass before you qualify as an ACCA.

Practical Experience Requirement

Quality and quality measurement are not only issues you need to know about for your exam. They are also important for your work as an accountant. The ACCA Practical Experience Requirements indicate that, in order to perform effectively, accountants need to 'Allocate and monitor the progress and **quality** of work in their area of responsibility'.

4 The ISO 9000:2000 and 2008 series of standards

A number of organisations produce quality standards that can be applied to a variety of organisations. The most widely used are those published by the **International Organisation for Standardisation (ISO).**

FAST FORWARD

The ISO 9000 quality standards have been adopted by many organisations world-wide. A company registering for ISO 9000 certification is required to submit its quality standards and procedures to external inspection. If it receives a certificate, it will be subjected to continuing audit. The aim of an ISO 9000 certificate is to provide an **assurance to customers** (and suppliers) of the organisation that its products are made, or its services are delivered, in a way that meets ISO's **standards** for quality.

ISO issue standards are applicable to **many types of organisation** and they are updated periodically. The ISO 9000: 2000 and 2008 series of standards consists of four primary standards: ISO 9000, ISO 9001, ISO 9004, and ISO 19011. In addition, ISO 14001 addresses environmental management.

(a) **ISO 9001:2000 and 2008** contain ISO's current quality management system requirements. This is the standard you need to use if you wish to become certified (registered).

(b) **ISO 9000:2005 and ISO 9004:2009** contain ISO's quality management system guidelines. These standards explain ISO's approach to quality management – ISO 9000:2005 presents definitions, discusses terminology and defines the eight quality management principles while ISO 9004:2009 is a set of guidelines for improving performance. These guideline standards help organisations implement quality management, but they are not intended to be used for certification purposes.

(c) **ISO 19011** covers quality auditing standards.

(d) **ISO 14001** relates to environmental management systems. It specifies a process for controlling and improving an organisation's environmental performance. Issues covered include:

(i) Use and source of raw materials
(ii) Waste
(iii) Noise
(iv) Energy use
(v) Emissions

Importantly, ISO 9000:2000 is based on a process orientation which requires organisations to define and record their core processes and sub-processes. (Note the potential links here to concepts such as the value chain and critical success factors, which identify the key processes and activities an organisation has to excel at to achieve its objectives and deliver value to its customers.)

ISO 9000:2000 also stresses four other principles (which resonate with a number of the aspects of performance management we have been discussing in this text so far):

(a) Quality management should be **customer-focused**

(b) Quality performance should be **measured**. Measures should relate both to **processes** that create products or services, and to **customer satisfaction** with those products or services.

(c) Quality management should be **improvement-driven**. Improvement must be demonstrated in both process performance and customer satisfaction.

(d) **Senior management** must demonstrate their **commitment** to maintaining and continually improving management systems.

4.1 ISO certified/registered or ISO compliant?

When a company claims that they are **ISO 9000 certified** or **registered**, they mean that **an independent registrar** has audited their processes and certified that they meet the ISO requirements. It means that a **registrar has given a written assurance** that ISO's quality management system standard has been met.

When an organisation says that they are **ISO 9000 compliant**, they mean that they have **met ISO's quality system requirements**, but have **not been formally certified** by an independent registrar. In effect, they are **self-certified**. Of course, an official certificate does tend to carry more weight in the market place.

Organisations are granted certified or **compliant** status on the basis that their **processes** rather than their products and services meet ISO 9000 requirements. The ISO 9000 standards are **process standards**, not product standards. The logic is that high quality processes ensure high quality output.

ISO 9000 has been criticised, however, for encouraging a culture of **management by manual**. The requirement to document all procedures and to conduct internal audits of the system and its procedures, is also both time consuming and expensive.

4.2 Criticisms of quality accreditation

Many writers and managers have criticised **formal quality schemes**. These criticisms tend to emphasise the following points.

(a) Documentation is **expensive** (in terms of time) to produce.
(b) Rigid policies and procedures **discourage innovation** and initiative.
(c) The schemes **encourage bureaucracy**.
(d) The formal methods may not be consistent with ways of working in small and medium-sized organisations.

5 The quality management system

We have already provided a definition of QMS. Its rather general nature is inevitable, since there is no single approved model for a QMS. However, all QMS should be designed around the eight quality management principles given in ISO 9001:2005.

- Customer focus
- Leadership
- Involvement of people (1)
- Process approach (2)
- Systems approach to management (3)
- Continual improvement
- Factual approach to decision making
- Mutually beneficial supplier relationships

Notes

(1) When we discuss job design in another chapter, you will see how the influence of Japanese management practice has led to the now commonly adopted principle that **quality is everybody's concern**. An important result of this approach is increased employee involvement in quality management through such mechanisms as **quality circles**.

(2) This means managing related activities and resources as integrated processes.

(3) This means managing groups of related processes as integrated systems

5.1 The costs of quality

FAST FORWARD

Part of the purpose of quality management is to manage both the **cost of failure** and the cost of **inspection** and **presentation** so as to minimise quality related cost overall. An effective QMS will also improve the organisation's ability to deliver satisfactory outputs; it should lead to enhanced staff commitment; and it should improve relationships with customers.

Operating a QMS inevitably incurs cost. *Juran* analyses the costs associated with quality management into four types.

(a) **Inspection** or **appraisal costs** are incurred in establishing the **extent of conformance** to quality standards and include the costs of such activities as testing, inspection and the calibration of measuring equipment.

(b) **Prevention costs** are incurred in activities intended to ensure that quality is maintained: such activities include quality training, supplier surveys, quality planning and the work of quality improvement teams.

Taken together, these two categories make up the **cost of operating a QMS**. Against them must be set the **costs of quality failure**.

(a) **Internal failure costs** are incurred when a quality failure is discovered before the product or service is delivered to the customer. Examples are the costs of scrap, rework and re-inspection.

(b) **External failure costs** are incurred when a quality failure is incurred after the product or service has been delivered to the customer. Examples are the costs of complaint processing, warranty claims and product recalls.

Part of the skill of quality management is the minimising of these costs **in total**. The more rigorous the QMS, the lower the eventual costs of failure are likely to be, but the higher the costs of prevention and appraisal. The aim must to achieve a sensible balance between the two categories.

5.2 The advantages of having a QMS

An effective QMS, as well as minimising quality-related costs will have other important advantages.

(a) An improvement in the organisation's ability to deliver outputs of consistently satisfactory quality
(b) An improved level of staff commitment based on pride in work
(c) Improved customer relationships, with fewer complaints and increased turnover

5.3 The quality manual

FAST FORWARD

An organisation's quality manual specifies its quality management system.

Key term

A **quality manual** is 'a document specifying the quality management system of an organisation'.
ISO 9000:2005

The ISO definition given above implies that there are two important aspects to the nature of the quality manual. The first is that it contains **practical details and instructions** for the operation of quality procedures and systems, so it is an everyday working document within the organisation. The second is that it is an important aspect of the design of the QMS and, as such, provides much of the **quality assurance** sought by external agencies such as customers and certification bodies. The quality manual is fundamental to quality management.

The quality manual is likely to contain a wide range of material: this can be grouped into a number of categories.

(a) **Policies** relating to quality
(b) The **organisation structure** that relates to quality management: this is likely to be identical with the overall structure of the organisation, or nearly so.
(c) Details of **quality procedures**: this category includes a wide range of documentation.

Keeping the quality manual up to date is one of the responsibilities of the **quality manager**.

5.4 Policies relating to quality

FAST FORWARD

Quality policies may include a mission statement, a corporate policy statement and process specific polices.

A **quality process** is a statement of the specified way to carry out an activity or a process

There are two types of quality process: **core business processes** and **supporting processes**.

Key term

Quality policies define 'the overall intentions and direction of an organisation related to quality as formally expressed by top management'. *ISO 9000:2005*

Statements of **quality policy** may be divided into three types.

(a) The **mission statement** is a brief statement of overall quality policy and commitment set down at the most senior level of management. It will probably refer to customer satisfaction, ISO 9000 and the importance of good quality practice.

(b) The **corporate policy statement** expands upon the mission statement. Tricker and Sherring-Lucas suggest that the eight quality principles already mentioned provide a good basis for drafting this policy. They also state that it should conform to five requirements.

    (i) It should be appropriate to the needs of the organisation and its customers
    (ii) It should involve all members of the organisation
    (iii) It should provide an outline of the organisation's goals and objectives
    (iv) It should be communicated and implemented throughout the organisation
    (v) It should be understood by everyone involved

(c) **Process-specific policies** will relate directly to the organisation's processes and quality requirements. They should be adequate to manage quality in all key processes.

5.4.1 Processes and procedures

The words **process** and **procedure** are used in very specific ways in quality management practice based on the ISO 9000:2005 series; it is important that you understand these usages and how they differ from the everyday meanings of these words.

In ordinary use, **process** and **procedure**, while, perhaps, not quite interchangeable, can be used with very similar meanings: we might, for example, speak of a company's accounting processes or its accounting procedures and mean much the same thing. This is not the case in quality management. The difference is summarised in the definitions given below.

Key terms

A **quality process** is 'a set of inter-related or interfacing activities which transform inputs into outputs'.

A **quality procedure** is the 'specified way to carry out an activity or a process'.

5.4.2 Quality processes

The definition of **quality process** will remind you of our discussion in an earlier chapter of the model of an organisation as an **open system** interacting with its environment. Here, we may consider a quality procedure to be a **subsystem** of the overall organisational system. We must consider **ten elements** in this subsystem.

(a) The first three of these elements are the **process** itself, the **inputs** into it and the **outputs** from it.

(b) The next two elements are **suppliers**, from whom inputs are obtained, and **customers,** to whom outputs are delivered. Both customers and suppliers may be internal to the organisation, since many processes are operated in co-ordinated chains.

(c) **Inputs** is used in a very narrow sense and must not be confused with the next element, the **resources** that are required to make the process work. For example, in a simple manufacturing operation, **inputs** would be parts and raw materials, while the labour and machinery required to process them would be **resources**.

(d) Similarly, **controls** constitute a separate element: they are applied to the process but are separate from both **inputs** and **resources**.

(e) There are three further elements. The **purpose** of the process is a statement of what it is intended to achieve. The **process owner** is accountable for the operation of the process as a whole. **Performance targets and measures** are established and enforced by the **controls**.

Quality processes are divided into two types: **core business processes** and **supporting processes**. The concept is similar to that of primary and support activities in the **value chain model**, but the definitions are rather different.

(a) **Core business processes** combine in a logical sequence that proceeds from a market opportunity through to the delivery of a satisfactory product or service. The process owner for the overall sequence of core business processes would normally be the CEO or equivalent.

(b) **Supporting processes** supplement the core business processes by providing the necessary infrastructure. These processes will be owned by functional directors or managers.

Both core business processes and supporting processes must be fully documented, possibly using diagrams in a hierarchy of detail.

5.4.3 Quality procedures

FAST FORWARD

ISO 9001:2000 and 2008 mandates a minimum of six specific written quality procedures. These cover two QMS processes and four MAI processes.

- Control documents
- Control records
- Internal audit
- Product failures
- Corrective action
- Preventive action

Quality procedures are the **detailed instructions** that lay down precisely **how** and **to what standards** quality processes are to be operated. They are only prepared where they are necessary and only in the detail that is needed in practice. A quality procedure may be very simple, or quite complex, possibly containing such items as lists of abbreviations, amendment records, distribution lists, statements of responsibility and examples of relevant forms as well as the detailed process instructions themselves. The detailed technical requirements and specialist procedures are normally contained in subsidiary **work instructions**.

ISO 9001:2000 and 2008 requires that, as a minimum, **written procedures** must exist to control **two QMS processes** and **four processes relating to measurement, analysis and improvement** (MAI).

5.4.4 Compulsory QMS processes

Control of documents

It is important to ensure that only the latest issue of quality related documents such as drawings and instructions is used. Such documents must also be approved before use and subject to periodic review.

Control of records

Records are important both for purposes of quality assurance and for the future development of improved procedures. Procedures must be laid down to ensure that proper records are kept and to specify details of storage, retrieval, retention period and eventual disposal.

5.4.5 Compulsory MAI processes

Internal audit

Internal quality audit is required by ISO 9001:2000 and 2008. The internal audit procedure must specify audit responsibilities, the frequency and extent of audit and the means of dealing with procedural failures.

Product failures

Defective or damaged products must not be delivered or used. Such products must be dealt with in one of three ways.

(a) **Rectification** followed by checking to ensure quality conformance
(b) '**Use under concession**' allows for a formal authorisation to make use of the product.
(c) **Prevention of use**, usually by quarantine and controlled disposal

Corrective action

A procedure is required to identify occasions of quality failure, investigate them, deal with the causes so as to prevent recurrence and verify that the new arrangements operate satisfactorily. All this must be properly recorded.

Preventive action

Appropriate efforts should be made to prevent the occurrence of quality failure. Potential instances should be identified, preventive action taken and reviewed and the whole process recorded.

5.4.6 Other necessary processes

While not specifically mandated as such, the standard implies that two other areas should be documented. These are **communication with customers** and the **evaluation and selection of suppliers**.

5.4.7 Quality objectives

The corporate policy statement and process-specific policies are likely to include **quality objectives**. These objectives should relate to the variables that determine whether or not proper quality is achieved.

Quality objectives should be '**SMART**' in the same way that strategic objectives (discussed earlier in Chapter 7) should be SMART: **s**pecific, **m**easurable, **a**ttainable, **r**elevant, and **t**ime-bounded.

5.4.8 Quality management and performance management

Earlier in the chapter we defined quality, and the definition was: 'the degree to which a set of inherent characteristics fulfils requirements.'

However, we could also add to that definition that quality also reflects the degree to which a product or service consistently **conforms to customers' expectations**.

Quality should be a key concern in all organisations. High quality goods and services can give an organisation a competitive edge over its rivals. Good quality also reduces the costs of rework, waste, complaints, and returns an organisations incurs; and – perhaps most importantly – good quality generates satisfied customers.

In this respect, quality improvements can have a major affect on other aspects of an organisation's performance. For example, revenues can be increased by better sales and being able to charge higher prices (relative to poorer quality products). At the same time, costs can be reduced through improved efficiencies and productivity.

However, the additional definition of quality also highlights the importance of the customer in any discussion of quality.

From the customer's perspective, quality problems arise when the customer's perception of a product or service fails to match their expectations of it. Therefore a key aspect of quality management is ensuring that products or services meet customers' expectations of them.

However, in order to do this, an organisation has to know:

(a) What the customers' expectations of its product or service are

(b) What the key processes and success factors are that will enable it to achieve customers' expectations

For example, let us consider some quality characteristics for an online grocery shopping service:

Quality characteristics	Examples
Product characteristics	Product range Product availability Shelf life / durability of products Products not damaged (Also, possibly more generally, the taste/flavour of the products)
Delivery service characteristics	Reliability of service (turns up when scheduled) Accuracy of delivery (what is delivered agrees to what was ordered) Products not damaged when delivered Attitude of delivery driver; and physical appearance (of driver and delivery vehicle) Coping with any errors (eg response if customer notices any differences between what was ordered and what is delivered)

Quality characteristics	Examples
Website characteristics	Ease of use Reliability of website (eg doesn't crash) Security of website

Importantly, however, once these quality characteristics have been identified, they also indicate the areas of the operation's performance which are **important to measure**; to ensure that quality levels are maintained against acceptable standards.

This is a point we will return to later in the chapter when we look at Six Sigma as a method of quality improvement. The first stage in implementing a Six Sigma programme is 'Defining customer requirements.'

6 Quality in management information systems

FAST FORWARD

Four aspects of quality are particularly important in software.

- Functionality
- Reliability
- Usability
- Build quality (flexibility, expandability, portability, ease of maintenance)

Low quality in IS development produces systems that are difficult to use, maintain and enhance.

Your syllabus requires you to have some knowledge of quality management in information systems (IS) development. The complexity and internal integration of many IS makes them particularly susceptible to undesirable effects caused by defects of design and coding in particular. If you have used a PC at all you are likely to have had experience of the frustration and delay caused by defects in even such well-established systems as *Microsoft Windows*.

6.1 Consequences of low quality in IS

Poor design and coding produce IS that are difficult to use, maintain and enhance. This has undesirable consequences.

(a) **Excessive costs** are incurred in correcting defects and adding or improving features to make the systems usable.

(b) **User confidence** is undermined.

(c) **Business efficiency** is harmed, with harmful effects on customer satisfaction and thence on profitability and even on the continuing existence of the organisation.

6.2 Features of good software

Four aspects of quality are particularly important in software.

(a) **Functionality** is the ability of the system to perform the tasks expected of it. It should do what the user wants it to do.

(b) **Reliability** means that the system keeps working and is not out of service frequently or for extended periods. Also, it does not produce unexpected or bizarre outputs.

(c) **Usability** means that the system is easy to use effectively.

(d) **Build quality** is evidenced by such features as ease of **maintenance**, **flexibility** in use, **expandability** and **portability** between platforms.

Failures of **functionality** and **reliability** give rise to the undesirable consequences already mentioned. Lack of **usability** will make operation of the system complex and costly in staff time; it will also require the

provision of **extensive training** to users. Poor **build quality** will damage prospects for further overall system development in the future, as well as complicating maintenance and upgrades.

Software quality could be very important for managers if they are using the software to produce management information. If managers are unable to review reports which give them relevant, timely and accurate information about how their business is performing, this will make their job of managing performance much harder.

7 The qualities of good information and good management information systems

FAST FORWARD

As well as ensuring that it has good quality information systems, an organisation also needs to ensure that it produces good quality management information.

Just because an organisation has good quality information systems does not guarantee that the reports or information those systems produce will be useful for management.

Earlier in this text we have highlighted some of the characteristics that good management information should demonstrate: for example, it should be timely, accurate, and relevant to its recipients.

'Good' management information is information that adds to management's understanding of performance or a particular issue, and can help them control the business.

The qualities of good information are outlined in the following table. You can use the mnemonic ACCURATE to help you remember the qualities of good information.

Quality	Example
Accurate	Figures should add up, the degree of rounding should be appropriate, there should be no typos, items should be allocated to the correct category, assumptions should be stated for uncertain information.
Complete	Information should include everything that it needs to include, for example external data if relevant, comparative information or qualitative information as well as quantitative. Sometimes managers or strategic planners will need to build on the available information to produce a forecast using assumptions or extrapolations.
Cost-beneficial	It should not cost more to obtain the information than the benefit derived from having it. Providers of information should be given efficient means of collecting and analysing it. Presentation should be such that users do not waste time working out what it means.
User-targeted	The needs of the user should be borne in mind, for instance senior managers need strategic summaries periodically, junior ones need detail.
Relevant	Information that is not needed for a decision should be omitted, no matter how 'interesting' it may be.
Authoritative	The source of the information should be a reliable one (not, for instance, 'Joe Bloggs Predictions Page' on the Internet unless Joe Bloggs is known to be a reliable source for that type of information). However, subjective information (eg expert opinions) may be required in addition to objective facts.
Timely	The information should be available when it is needed. It should also cover relevant time periods, the future as well as the past.
Easy to use	Information should be clearly presented, not excessively long, and sent using the right medium and communication channel (e-mail, telephone, hard-copy report etc).

Exam focus point

In Chapter 6 we looked at the dangers of information overload, and when assessing the quality of information (eg relevance; ease of use) it could be useful to think whether there is a danger that too much information is being provided.

Improvements to information

However, as well as being able to identify the qualities of good information, you may also need to identify the problems that an organisation is having with the information it currently produces, and to suggest potential ways that information can be improved.

The table below contains some suggestions as to how poor information can be **improved**.

Feature	Examples of possible improvements
Accurate	Use computerised systems with automatic input checks rather than manual systems. Allow sufficient time for collation and analysis of data if pinpoint accuracy is crucial. Incorporate elements of probability within projections so that the required response to different future scenarios can be assessed.
Complete	Include past data as a reference point for future projections. Include any planned developments, such as new products. Information about future demand would be more useful than information about past demand. Include external data.
Cost-beneficial	Always bear in mind whether the benefit of having the information is greater than the cost of obtaining it.
User-targeted	Information should be summarised and presented together with relevant ratios or percentages. Consider use of graphics or dashboards for summarised data for senior management.
Relevant	The purpose of the report should be defined. It may be trying to fulfil too many purposes at once. Perhaps several shorter reports would be more effective. Information should include exception reporting, where only those items that are worthy of note – and the control actions taken by more junior managers to deal with them – are reported.
Authoritative	Use reliable sources and experienced personnel. If some figures are derived from other figures the method of derivation should be explained.
Timely	Information collection and analysis by production managers needs to be speeded up considerably, probably by the introduction of better information systems (possibly even systems that can provide real-time information).
Easy-to-use	Graphical presentation, allowing trends to be quickly assimilated and relevant action decided upon. Alternative methods of presentation should be considered, such as graphs or charts, to make it easier to review the information at a glance. Numerical information is sometimes best summarised in narrative form or vice versa. A 'house style' for reports should be devised and adhered to by all. This would cover such matters as number of decimal places to use, table headings and labels, paragraph numbering and so on.

8 Six Sigma and quality improvement

FAST FORWARD

Six Sigma is a quality management system that grew out of statistical quality techniques. The overall aim is a very high and consistent standard of quality output. It tends to take the form of specific improvement projects that follow a standard five phase pattern.

- **Define** requirements
- **Measure** performance
- **Analyse** the process
- **Improve** the process
- **Control** the new process

It depends to some extent on charismatic leadership.

Six Sigma is a quality management methodology developed at *Motorola* in the late 1980s. Originally, it was set of statistics-based techniques used by managers to assess manufacturing process performance. It has evolved into a widely applicable process improvement system with links to **process re-engineering**. Both *Harmon* and *Pande and Holpp* describe Six Sigma as the latest development in an evolutionary process that began with Scientific Management and continued through lean manufacturing and TQM.

There are three classifications of **process change work** which we will introduce here briefly.

(a) **Process improvement** is a tactical level incremental technique that is appropriate for developing smaller, stable existing processes.

(b) **Process reengineering** is used at the strategic level when major environmental threats or opportunities mandate fundamental re-thinking of large scale, core processes that are critical to the operation of the value chain.

(c) **Process redesign** is an intermediate scale of operation appropriate for middle-sized processes that require extensive improvement or change.

Pande and Holpp think that Six Sigma is applicable to all three approaches and declare that 'achieving the goal of Six Sigma requires more than small, incremental improvements; it requires breakthroughs in every area of an operation'. They emphasise Six Sigma's track record of producing major return on investment and its effects on management methods.

On the other hand, Harmon describes Six Sigma as typically employed in **process improvement projects**. He goes on to say that it is very good at 'describing how to think about measuring process and activity outcomes' and 'how to use statistical techniques to analyse the outcomes and decide on corrective action'.

Pande and Holpp identify six themes in Six Sigma.

- Genuine focus on the customer
- Data– and fact-driven management
- Processes as the key to success
- Proactive management
- Boundaryless collaboration
- Perfectionism combined with tolerance of failure

Exam Focus Point

The following section is useful background which explains the theory behind Six Sigma. You will not need to know this for the exam but it helps you understand how Six Sigma was developed.

You will not need to do any calculations in the question which test Six Sigma.

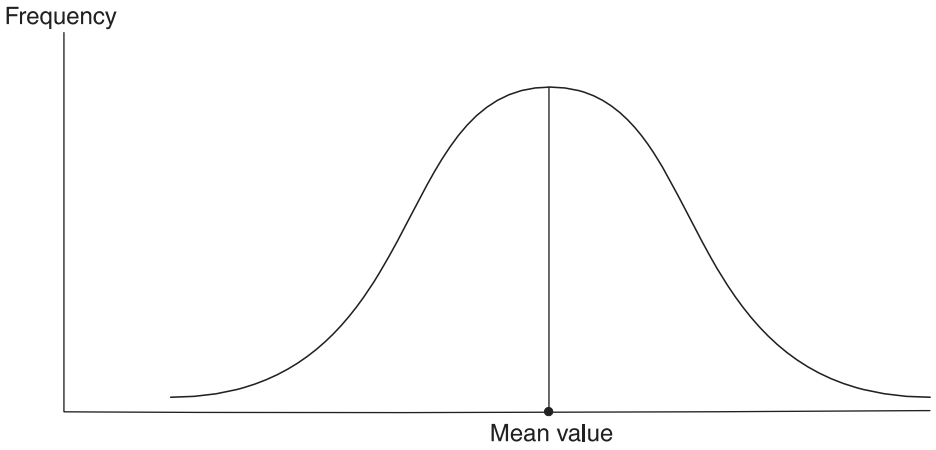
8.1 The Six Sigma concept

The essence of Six Sigma is to improve a process to the extent that there is only the tiniest probability that it will produce unsatisfactory outputs. Note that we speak of probability: there are no certainties in this sort of work and we need to look a little further at **probability** to understand what is going on.

8.1.1 The normal distribution

The kind of probability we are concerned with is based on variation of a characteristic within a population. The population might be, say, men in the UK and the characteristic might be, say height. Equally well, the population might be all the widgets a factory produces in a year and the characteristic might be their weight in grams. The important point about these two characteristics is that they **vary** from individual to individual and their variation is **normally distributed**.

Normal distribution of a population variable implies that its magnitude tends to clump around the mean, but there are also likely to be individual cases that are quite a long way from the mean. If we draw a graph to show the **frequency** with which actual measurements occur in a normally distributed variable, it will be a **bell shaped curve** such as the one below.



A good way to visualise the way the normal distribution works is to imagine **looking down vertically on a football pitch** with a large number of people standing on it. We have measured all these people's height and worked out the mean.

We persuade all the people whose height is **equal to the mean** to line up one behind the other **along the half way line**, starting from one of the touch lines; then the people who are one centimetre taller than the mean line up immediately to their right and those who are one centimetre shorter line up on their left, both starting from the same touch line. Then we repeat the process with those who are two centimetres taller and two centimetres shorter and so on, until everyone is in place.

If we then look down on the **shape of our crowd**, we will find that it is very close indeed to the curve shown above. We have drawn a graph using the touch line as the x axis and the centre line as the y axis. The people of mean height will be the most numerous and they will be at the centre of the curve. Taller and shorter people will be fewer in number and the greater the difference from the mean, the fewer people there will be. Eventually, as we move out towards the goal lines at either end, there might only be one or two people who are sufficiently tall or short to qualify.

It would probably take several thousand people to make this demonstration work. Even so, they would represent only a **sample** of the entire population of the country, so it is unlikely that we would encounter anyone who was outstandingly tall or short. But such people do exist and we cannot say for certain where the final limits of human height lie. The same is true of all normally distributed variables and so the tails of the normal curve never actually meet the x axis of our graph.

Standard deviation

However, we can say some other very precise things about our normally distributed variable. We can work out a measure of the variable called the **standard deviation**. How this is done need not concern us here, so long as we understand what it tells us. The standard deviation gives us an indication of the **dispersion**

of the variable; that is to say, whether the curve is very tall and narrow, with most of the population values very close to the mean, or very low and flat, covering a wide range of measurements. The smaller the standard deviation, the taller and narrower the curve.

The standard deviation is interesting when we come to consider **probability**. The area under a part of the curve defined by a given number of standard deviations from the mean is easily obtained from mathematical tables. So, for example, if we take the part of the curve that lies within **two standard deviations** on either side of the mean, we find that approximately **95%** of the population will lie under it.

Going back to our height example, if the mean is 170 cm and the standard deviation is 10 cm, we can say that approximately 95% of people are between 150 cm and 190 cm tall. If we include everybody within **three standard deviations**, using the tables, we can say that over 99% of the population will be between 140 cm and 200 cm tall.

This is all very comforting and precise, but what does it have to do with **probability**, which, you may recall, was why we started on the normal distribution in the first place?

Probability

To deal with probability, we have to turn the concept on its head. We started off by describing the normal curve in terms of a **very large number of people** and we have discussed how it defines one of their variable characteristics: height in our example. We now think about what it can tell us about a **single individual**. While it cannot tell us anything absolutely precisely, it can tell us something useful with a certain degree of probability.

If we know, for example, that a person is a member of the population whose height we measured earlier, we can say **with 95% probability** that his or her height must lie in the range 170 cm to 190 cm. That is, we know that 95% of the population lie within that range, so a randomly chosen individual must therefore have a **95% chance** of being in that section of the population and, equally, of lying in that height range. Another way of using the same facts would be to say that our randomly chosen person has **only a 5% chance of lying outside** that height range.

8.1.2 Probability and process quality

The probability aspect of the normal distribution becomes very important for **process quality** when we start to think about product characteristics. We said that the essence of Six Sigma is to improve a process to the extent that there is only the **tiniest probability** that it will produce **unsatisfactory outputs**. In other words, we want to **control** things like widget weight so that it has only a tiny percentage chance of lying outside the acceptable limits.

We have spoken of 95% and 99% probability, both of which are regarded as pretty close to certainty. However, for Six Sigma we want to do better. The area under the normal curve out to three standard deviations includes well over 99% of all individual occurrences. If we extended the curve out to six standard deviations, the occurrences that were not covered would be **very, very few** indeed. This is the principle of Six Sigma: reduce the probability of defects to the minute level defined by the area **more than six standard deviations from the mean** (The Greek letter sigma in its lower case form (σ) is the usual mathematical symbol for standard deviation, hence six sigma)

In fact, the distribution used in the statistical theory that underpins Six Sigma differs slightly from the normal curve because of a phenomenon called long run process drift. Using this approach, only **3.4 items in a million** will lie outside the limit of six standard deviations either side of the mean. The goal of Six Sigma, therefore is to **reduce failures to a rate of less than 3.4 in a million**.

An important implication of this approach is that success is represented by a **band of quality** rather than a single specification. That band is defined as six standard deviations either side of the mean. Fairly obviously, if the measurements that correspond to those limits are close together, the standard deviation of the permitted measurements will be **very small** and the graph of the overall distribution will be very tall and thin.

Tolerances

It may be easiest to think about this in terms of a simple manufactured component, such as the piston in a single cylinder petrol engine. If the piston is too big, it will bind in the cylinder, or, possibly not even fit into it at all. If it is too small, it will both fail to capture the power generated from burning the fuel and it will move in an irregular fashion and cause excessive wear in the cylinder.

However, this does not mean that all pistons must be absolutely identical to the limit of measurement. Between the unacceptable extremes outlined above, there will be **a range of dimensions that are acceptable**. This range will be very narrow indeed, but it will exist. In fact, the specification for the piston diameter will probably be given with a *tolerance* such as 'plus or minus four thousandths of an inch'.

Whatever the physical dimensions of the permitted tolerance, Six Sigma requires that they must equate to plus or minus six standard deviations from the mean of the entire output of pistons if the manufacturing process is to qualify as operating at the Six Sigma level of quality.

This principle can be extended to processes other than manufacturing so long as some form of quantitative measurement is possible.

8.2 Process improvement with Six Sigma

As indicated above, Harmon suggests that Six Sigma is best applied to the **incremental improvement of fairly narrowly defined processes and sub-processes**; it is not an appropriate approach to process re-engineering or radical redesign. However, it must always be clear how the target process relates to the wider functional and strategic background.

An important feature of the system is its emphasis on the importance of basing management on **well-substantiated data** rather than opinion and intuition.

Exam focus point

In Chapter 3 we looked at business process re-engineering (BPR), and noted it involves the fundamental rethinking and radical redesign of business processes to achieve dramatic performance improvements.

By contrast, Six Sigma process improvement is best applied to the *incremental* improvement of processes and is not appropriate for radical redesign.

Make sure you appreciate this distinction in the relative suitability of the two methodologies for different scenarios.

8.2.1 Organising Six Sigma

When an organisation decides to commit to Six Sigma, it will normally appoint an overall **implementation leader** and form a **steering committee** at a senior level to provide a vision for the process and to oversee it. One of the principal responsibilities of this committee will be to nominate process areas for improvement. Each area will constitute a separate project and will have its own Six Sigma **project team** and **sponsor** or **champion**. The sponsor will be a member of the steering committee or may be the process sponsor (the process owner in ISO 9000:2000 terms). The project team will be made up of **staff experienced in the process** under review; for smaller scale projects, they will be the staff actually operating the process.

Staff involved in the **leadership of projects** may possess varying grades of qualification in Six Sigma.

(a) **Master Black Belts** are in-house consultants in Six Sigma and spend all of their time on it. They are especially skilled in the statistical techniques involved and will contribute to several projects simultaneously.

(b) **Black Belts** also spend all of their time on Six Sigma and lead specific projects.

(c) **Green Belts** also lead projects. They are managers who retain other job responsibilities alongside Six Sigma.

A Six Sigma project is likely to entail a large amount of training, both for the various leader grades and for the process operating staff that make up the project teams. **Empowerment** is a feature of the system in

that improvements are expected to flow from the bottom upwards. Team members are expected to commit to and take responsibility for the improvement work they are involved in.

Basic **project management techniques** are used in Six Sigma. Each improvement project will have a **charter** that defines its purpose, scope, assumptions and constraints in broad terms. This document will be subject to revision during the life of the project as its assumptions are challenged.

8.2.2 Six Sigma project phases

Six Sigma process improvement projects follow a **five phase** pattern known by the acronym DMAIC.

- **Define** customer requirements.
- **Measure** existing performance.
- **Analyse** the existing process.
- **Improve** the process.
- **Control** the new process.

Exam focus point

A question in the June 2012 exam asked candidates to explain how Six Sigma could help improve the quality of performance in an organisation, and then to illustrate how the DMAIC method could be applied in that organisation in order to implement Six Sigma.

Exam Focus Point

Notice that the 'D' in DMAIC relates to defining *customer* requirements, not defining the problem or issue. 'Customer' is actually the key word here. One of the key themes in Six Sigma is establishing a genuine focus on the customer, and what is important for the customer.

8.2.3 Define

The definition phase is a planning phase and includes project definition and the documentation of the existing process. Typically this will take one to two weeks, with the team meeting two or three times each week. A project charter may be provided by the project sponsor, but it may be necessary for the team to negotiate project scope and goals. The establishment of precise **customer requirements** from the process in question is an essential part of this phase. *Kano* divides customer requirements into three levels.

- **Basic** requirements are the minimum the customer will accept.
- **Satisfiers** improve the quality of the customer's experience.
- **Delighters** are totally unexpected by the customer.

Both external and internal customers may be vague in stating their requirements so careful research and logical definition are required.

A further important output from this phase is careful documentation of the process as it exists, probably using some form of **flow diagram**.

8.2.4 Measure

In the measure phase, statistical tools to assess current performance are selected using black belt expertise. Harmon, quoting *Eckes*, suggests three measurement principles.

- Only measure what the **customer** thinks is important.
- Do not measure things that the customer is satisfied with.
- Only measure things that **can be improved**.

There are three main areas for measurement.

- **Inputs** such as raw materials and product specifications
- **Process elements** such as cost, time, skills and training
- **Outputs and customer satisfaction**

Fairly clearly, outputs and customer satisfaction derive from and are determined by inputs and processes. According to Pande and Holpp, it is common to represent this relationship as an equation Y=f(X), where 'Y' represents outputs and 'X' represents inputs and processes. Y is then used in the jargon to mean goal or objective.

8.2.5 Analyse

Each element of the process may be assessed into one of three categories.

- **Value adding**
- **Necessary support** to value adding activities
- **Non-value adding**

Establishing the status of the various aspects of the process will require the use of a range of techniques including statistical analysis, and **fishbone analysis** (which you should be familiar with, from your P3 studies.)

Analysis should produce a list of problem causes and potential areas for improvement.

8.2.6 Improve

It may be particularly appropriate to **revisit the project charter** at the beginning of this phase, so as to incorporate any implications of the information obtained.

Improving the process demands a degree of **creative thought**. This can, to some extent, be guided by the wider experience of the team and its expert consultants. The problems identified in the analysis phase will indicate fruitful areas for consideration.

It is common for the people closely involved with the operation of a process to develop ideas for its improvement almost as soon as the possibility is raised. There is often value in these ideas, not least because of the great intimacy their authors have with the details of the process and its organisational setting.

Nevertheless, it is important that all proposals for improvement are subjected to a **rational review** so that their implications may be considered in as much detail as possible. **Cost** and **resource** consequences are of particular importance.

Implementation of the agreed improvements will require careful planning, probably small scale piloting and selling to stakeholders who were not involved in the project.

8.2.7 Control

Controlling processes is a **routine and continuing part of the management role**. When a process has been improved, it will probably be necessary to maintain some of the measurement processes used during the improvement effort in order to exercise control. However, the **cost of monitoring** must be considered, so it is likely that the extent of measurement will be minimised. Some processes can be monitored automatically, with control systems that generate exception reports automatically.

8.3 Example of DMAIC in context

We will now look at an example based on a restaurant ('The Foodhouse'), to illustrate how a Six Sigma project could be applied in practice.

The focus of The Foodhouse's project was on the customer satisfaction of customers who eat there. Their goal was ensuring customers are satisfied with the quality of their meal, and of the service they receive.

The project team identified a number of things about a dinner meal that *might* satisfy customers: quality of the food (taste, temperature); presentation of the food; variety of menu (number of items; daily specials); service (speed of food delivery; attention to customer's needs during the meal); ambience (room layout; cleanliness); and the price of the meal.

However, this list only showed the things that the project team thought might affect customer satisfaction. For their project to be effective, they had to determine the role that each of these possible requirements actually plays in customer satisfaction (that is, they had to **define** customer requirements).

They did this by asking all their customers to complete a short questionnaire survey after their meal.

The results of the survey showed that different types of customer have different requirements:

- For business customers, taste, temperature, speed of delivery and attentiveness during the meal were important factors.
- Elderly people indicated that taste, temperature and the availability of daily specials were most important to them.
- Customers with children indicate that taste, temperature and speed of delivery were most important to them.

The questionnaire responses gave the project team a clear idea of their customers' requirements.

They now had to identify **measures** to see how well they performed in satisfying these requirements.

One key measure The Foodhouse used to measure performance was the time it took for a customer to receive his or her meal (defined as the time between when the waiter took the order and when the meal is delivered to the table).

The total time is made up of the time it took the waiter to submit the order to the kitchen, the kitchen to cook the food and plate it up ready for service, and then for the waiter to deliver the meal.

The Foodhouse project team decided to split this process into two parts: the time it took waiters to place and deliver orders; and the time it took the kitchen to prepare and cook the food.

The team began to gather data on the time it took waiters to place and deliver orders, so that they could analysis it for trends as to what the most common causes of delay were when meals were delayed (the **analysis** phase).

The analysis indicated a number of things that took up a waiter's time and therefore interfered with the prompt placement of orders and delivery of food. These included: families with children wanting tables to be re-arranged; multiple tables all requiring waiter service at the same time; and tables wanting to make frequent drink orders.

This highlighted to the project team that an important issue affecting the speed of service was the control and placement of families. The team decided that two groups of families with children should not be put in the same area if possible; or if there was no alternative to putting families together, the number of tables served by the waiter dealing with them should be reduced, and extra tables should be allocated to another waiter. (This is the **'improve'** stage).

Overall, everyone was happy with the results obtained from the project. However, it was agreed that for one week every three months, follow-up customer feedback surveys would be distributed to all diners eating at the restaurant. The results from these surveys allow The Foodhouse's restaurant manager to monitor on-going customer satisfaction (the **'control'** stage).

Exam focus point

Importance of measurement. An important theme in the P5 syllabus is the nature of measurement, and how it might be related to quality, efficiency and reward.

However, management theorists often acknowledge that 'what gets measured, gets done.' But this also raises the caution of whether the indicators which are actually being measured are the ones which *should* be being measured in order to control critical business processes, or to promote a desired outcome.

The question scenarios in your exam may include examples of the 'wrong' measures being applied , in which case you may need to suggest alternative measures which should be used instead.

8.4 Six Sigma and new processes

Although the 'DMAIC' methodology is the methodology most commonly associated with Six Sigma, this should be used for **improving existing processes** rather than designing and **implementing new processes** or activities which are free from defects.

If an organisation is looking to design and implementing new processes or activities, then the methodology should be modified to 'DMADV'.

- **Define** customer requirements, and the objective of the process or activity
- **Measure** and identify product capabilities and process capabilities, and assess risks involved
- **Analyse** alternatives ways of designing the process or activity and evaluate them to choose the best alternative
- **Design.** Plan the design of the process or activity, optimise the design and then produce the design.
- **Verify.** Verify the actual process works as intended in the design, by carrying out trial runs. Then implement the process.

Chapter Roundup

- Quality management has developed from an inspection-based process to a philosophy of business that emphasises customer satisfaction, the elimination of waste and the acceptance of responsibility for conformance with quality specifications at all stages of all business processes.
- Changes to the **competitive environment**, **product life cycles** and **customer requirements** have had a significant impact on the modern business environment.
- In the context of **TQM**, quality means getting it right first time and improving continuously.
- **JIT** aims for zero inventory and perfect quality and operates by demand-pull. It consists of **JIT purchasing** and **JIT production** and results in lower investment requirements, space savings, greater customer satisfaction and increased flexibility.
- **Life cycle costing** assists in the planning and control of a product's life cycle costs by monitoring spending and commitments to spend during a product's life cycle.
- **Target costing** is a pro-active cost control system. The target cost is calculated by deducting the target profit from a predetermined selling price based on customers' views. Techniques such as value analysis are used to change production methods and/or reduce expected costs so that the target cost is met.
- The aim of **Kaizen costing** is to reduce current costs by using various tools such as value analysis and functional analysis.
- The essence of **continuous improvement** is the use of an organisation's human resources to produce a constant stream of improvements in all aspects of customer value, including quality, functional design, and timely delivery, while lowering cost at the same time.
- **Costs of quality** can be analysed into **prevention**, **appraisal**, **internal failure** and **external failure** costs and should be detailed in a **cost of quality report**.
- 'Quality' does not mean 'high quality'. It is the degree to which a set of inherent characteristics fulfils requirements. **Quality control** satisfies quality requirements, while **quality assurance** gives confidence that quality requirements will be satisfied. That is, quality control is about activities such as supervision and measurement, while quality assurance is about things that make those activities effective, such as training and quality records.
- The ISO 9000 quality standards have been adopted by many organisations world-wide. A company registering for ISO 9000 certification is required to submit its quality standards and procedures to external inspection. If it receives a certificate, it will be subjected to continuing audit. The aim of an ISO 9000 certificate is to provide an **assurance to customers** (and suppliers) of the organisation that its products are made, or its services are delivered, in a way that meets ISO's **standards** for quality.
- Part of the purpose of quality management is to manage both the **cost of failure** and the cost of **inspection** and **presentation** so as to minimise quality related cost overall. An effective QMS will also improve the organisation's ability to deliver satisfactory outputs; it should lead to enhanced staff commitment; and it should improve relationships with customers.
- An organisation's quality manual specifies its quality management system.
- Quality policies may include a mission statement, a corporate policy statement and process specific polices.

Chapter Roundup (cont'd)

- A **quality process** is a statement of the specified way to carry out an activity or a process
- There are two types of quality process: **core business processes** and **supporting processes**.
- ISO 9001:2000 mandates a minimum of six specific written quality procedures. These cover two QMS processes and four MAI processes.
  - Control documents
  - Control records
  - Internal audit
  - Product failures
  - Corrective action
  - Preventive action
- Four aspects of quality are particularly important in software.
  - Functionality
  - Reliability
  - Usability
  - Build quality (flexibility, expandability, portability, ease of maintenance)
- Low quality in IS development produces systems that are difficult to use, maintain and enhance.
- As well as ensuring it has good quality information systems, an organisation also needs to ensure that it produces good quality management information.
- Six Sigma is a quality management system that grew out of statistical quality techniques. The overall aim is a very high and consistent standard of quality output. It tends to take the form of specific improvement projects that follow a standard five phase pattern.
  - **Define** requirements
  - **Measure** performance
  - **Analyse** the process
  - **Improve** the process
  - **Control** the new process
- It depends to some extent on charismatic leadership

Quick Quiz

1 What is the difference between quality control and quality assurance?

2 What is the difference between a quality process and a quality procedure?

3 What does an ISO 9000 certificate mean?

4 An organisation has recently noticed it has suffered an increase in the cost of scrapped parts and materials it is incurring, and it has seen a loss of production time as a result of coping with errors.

Which of the 'costs of quality' do these issues indicate the organisation needs to address:

A Prevention costs
B Appraisal costs
C Internal failure costs
D External failure costs

5 Which of the following is NOT one of the standard five phase pattern used to improve existing processes in Six Sigma:

A Analyse the process
B Measure performance
C Create a new process
D Define customer requirements

Answers to Quick Quiz

1 Quality **control** is about fulfilling quality requirements while quality **assurance** is about providing confidence that quality requirements will be fulfilled.

2 A quality **process** transforms inputs into outputs of the quality required while the related quality **procedures** specify how that process should be performed.

3 The aim of an ISO 9000 certificate is to provide an **assurance to customers** (and suppliers) of the organisation that its products are made, or its services are delivered, in a way that meets ISO's **standards** for quality.

4 C. Internal failure costs (costs associated with errors which are dealt with inside the operation) include: the costs of scrapped parts and materials, or reworked parts and materials, and the lost production time as a result of coping with errors.

5 C. The 'C' in DMAIC stands for 'Control' the new process, not 'Create' the new process.

Now try the questions below from the Exam Question Bank

Number	Level	Marks	Time
Q19	Exam	20	36 mins
Q20	Exam	20	36 mins

Understanding life cycle costs helps determine opportunities for cost reduction, especially pre-production decisions where many of the subsequent costs are determined.

Takes selling price as given by market so, to achieve a desired profit margin, costs must be at or below target cost.

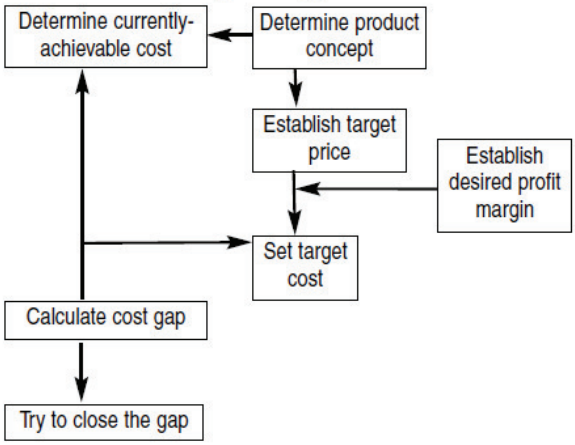
Life cycle costing

Traditional management accounting systems tend to report costs at the physical production stage of the life cycle and do not accumulate costs over the entire life cycle, assessing product profitability on a periodic basis instead.

Life cycle costing tracks and accumulates costs and revenues over the entire product life cycle, which means that a product's total profitability can be determined.

Target costing

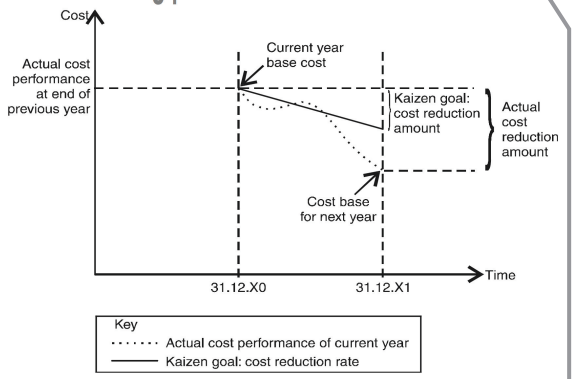
The target costing process



Kaizen costing

Focuses on obtaining small incremental cost reductions during the production stage of the product life cycle, using various tools such as value analysis and functional analysis.

Kaizen costing process



Kaizen provides opportunities for in-production cost improvements.

Kaizen is Japanese for 'improvement'.

Standard costing vs Kaizen costing

Used for ...	cost control	cost reduction
Focus is on ...	standard costs based on static conditions	actual costs assuming dynamic conditions
Standards/cost reduction **targets are set ...**	every 6–12 months	monthly
Costs are controlled ...	using variance analysis	by implementing continuous improvement
Employees are ...	the cause of problems	the source of solutions

Variances don't work as standards keep changing.

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

FAST FORWARD

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 lead 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.

Human resource management and the appraisal system

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	
		Perfect	*Imperfect*
Ability to measure output	*High*	Behavioural and or output controls	Output controls
	Low	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).

Nick Ryan is the lead tutor for ACCA Performance Management.

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**

2e Environmental accounting

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

FAST FORWARD

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.

Case Study

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.

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. • 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

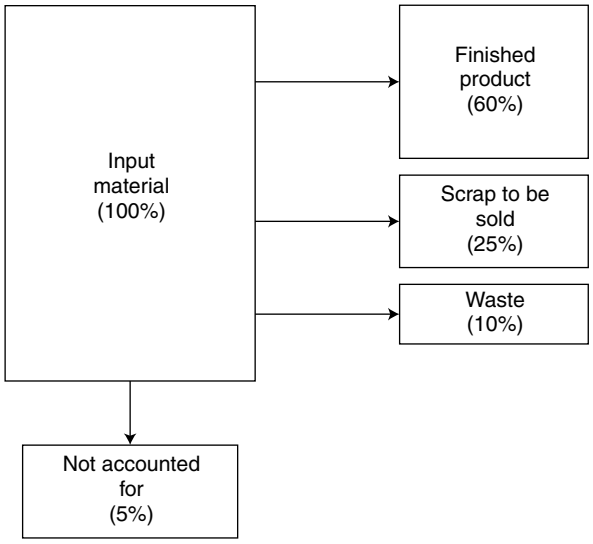
FAST FORWARD

The UNDSD (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 (UNDSD, 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**.

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,' (UNDSD, 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 UNDSD (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**.

Quick Quiz

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.

Answers to Quick Quiz

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 (UNDSD) 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.

Exam focus point

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

Environmental management accounting

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 (UNDSD) 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 UNDSD 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 UNDSD, 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 UNDSD 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 UNDSD, 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

Related Links

- **Student Accountant hub**

Environmental management accounting

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 (UNDSD), 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).

UNDSD (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). UNDSD 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 UNDSD (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). UNDSD (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,' (UNDSD, 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.

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