

Appendix 7: Introduction to the language of accounting

Online supplement for “The Making of an Expert Engineer” by James Trevelyan

January 2014

Two worlds: financial accounting and managerial accounting

The world of accounting can be separated into financial accounting and managerial accounting.¹ Financial accounting adopts an external focus. It measures an enterprise’s performance, over time and at a predetermined point in time. Financial accounting reports often become public documents, such as the annual report and financial statements, and are used by various stakeholders such as investors and the tax office. Managerial accounting, on the other hand is oriented towards helping those within the organisation. These reports are typically only seen by people within the organisation and usually provide information for decision-making.

Engineers are usually concerned with organisational performance and so managerial accounting is a more appropriate focus. However, the ultimate performance of an organisation is often evaluated on the basis of financial statements so engineers also can benefit from understanding the financial accounting.

Accrual accounting

This is the first major concept taught in any accounting class. Accrual accounting means recording transactions at the time when revenues and expenses are recognised, rather than when payments are actually made or received. This means that transactions are recorded when the goods associated with the transactions are purchased or supplied to others. For example, in the case of an annual magazine subscription for which the organisation pays in the first month, in accrual accounting there is a magazine expense entry every month corresponding to 1/12 of the annual subscription payment.

In the same way, a new machine is entered as an expense corresponding to the annual depreciation rate. It is not entered as a cash transaction at the time it is purchased. However, in order to determine the depreciation entry, we need to know the useful life of this machine. This, in turn, depends on the quality of the machine purchased, its duty cycle – how much of the time it is actually operating and how fast it wears out as a result, and how well it is maintained, protected from contamination and corrosion, and many other factors. Accrual accounting is based on many

¹ This section has been included thanks to contributions from Konrad Wenzel, a student with a particular interest in understanding the influence of accounting rules on maintenance in engineering enterprises.

estimates and assessments, each requiring judgement, and therefore can be more imprecise and subjective than many people realise.²

The definition of revenues and expenses are slightly different in accrual accounting compared with cash-based accounting. Since they represent inflows and outflows of economic resources, and may occur before or after the corresponding cash flow, calculating net profit, the difference between revenues and expenses over a particular period of time, requires great care.

Another factor connected with the choice of accounting method can be tax payments. In Australia, for example, companies can claim a tax credit for the goods and services tax (similar to value-added tax in many countries) that they pay on any goods and services received. Some companies prefer accrual accounting because brings forward their tax credits.

If an engineer can substantiate that certain technical actions such as regular planned preventative maintenance and inspection will extend the life of a machine or another physical asset, then the corresponding depreciation of the asset occurs over a longer time period. Hence the annual expense associated with the asset can be reduced. However, in some countries, it is possible to claim depreciation as an expense included in taxable income. Therefore, it may be financially preferable to claim depreciation at a higher rate in order to reduce the amount of taxable income and hence tax paid.

Expense recognition: challenges one way to define scratch that

One way to define an expense is a decrease in the company's wealth that was incurred in order to earn future revenues. Examples include wages paid to workers, electricity tariffs, interest payments and advertising costs. In accrual accounting, there is a 'matching close' concept that stipulates that an expense should be recognised at the same time as the relevant revenues that are earned as a result. Thus, the magazine subscription is paid at the start of the year, but the expense is only recognised in the months when the actual magazines arrive and can be read. If materials are purchased to make a product, their expenses recognised at the same time as the product is actually sold to a customer, even though this might occur much later. In the meantime, the materials are treated as an inventory asset. Of course, this is not always possible. In the case of advertising it is often impossible to relate advertising with subsequent sales that may occur months or even years later. Therefore in practice, many of these costs are entered as expenses when they are actually incurred.

Some expenses can be capitalised. For example, research and development may result in intellectual property that subsequently enables the profitable production and sale of goods. Therefore, the cost of research and development may be recorded as an asset which is then depreciated over several years at a rate determined by the judgement accounting experts. Maintenance, particularly preventative maintenance could be treated similarly. However financial accounting texts hardly pay any attention to maintenance so most organisations record maintenance as an expense when it is incurred.

² Readers interested in understanding these concepts in detail should refer to standard accounting texts such as explanations presented in (Hoggett (2005), Financial Accounting - Thomson, page 11). See also Horngren, Datar and Foster, Cost Accounting, A Managerial Emphasis (2003) Prentice Hall;

This short discussion is sufficient to understand that accrual accounting relies on extensive expert judgement, and therefore there is substantial subjectivity that may be hidden in what appear to be rigorously documented tables of financial transactions.

Non-current assets: costs, repairs and betterment

Assets can be seen as resources of the company needed to do business and can be classified into different categories. Short-term assets are called 'current assets', including cash and inventory. Longer term assets are referred to as 'non-current assets' which can include property, machinery and vehicles. The cost of an asset includes all the payments required for it to be ready to perform its intended purpose including the purchase price, transportation cost, taxes, installation and commissioning (or acceptance testing).

'Betterment' of an asset can be defined as modifications or improvements that increase the asset's useful life, productivity or efficiency. Only betterment costs can be added to the total cost of the asset by capitalisation. Repairs and other maintenance work are treated as an expense because it is considered that these are required in order for the asset to generate the originally planned revenues. Only improvements can be capitalised. Therefore, while maintenance is regarded as an expense, the lack of maintenance does not result in a corresponding reduction in the capitalised value of the asset. Lack of maintenance is not treated as an expense even though that may well be the result because the life of the equipment will be shortened.

Knowing this, engineers can carefully think about the way that they describe the work they do to keep equipment operating effectively. Naturally, the ways that different expenses influence tax payments can also be a significant factor.

Non-current assets: depreciation and re-valuation

Non-current assets are recorded as having value because the company intends to use them to gain economic benefits in future. As explained earlier, the cost of these assets is recorded as a regular expense corresponding to depreciation, allocating the expense on a particular asset over several years of operating the asset.

Here it is very important to distinguish between the way that the cost of an asset is recorded as an expense over several years on the one hand, and its value on the other hand.

Historically, it has been common to record the value of an asset in terms of the total value of payments necessary to acquire it and put it into operation. This is known as the 'historical cost method'. However, the value of an asset may not correspond to the historical acquisition cost. For example, a vehicle that has just been purchased usually cannot be sold back to the dealer at the same price that the company paid for it. In the same way, even if a machine could be sold for its purchase cost. The work required to transport it, install it, test it and prepare it for operation cannot be recovered. For this reason, companies in many countries are required to 'revalue' their assets so that the company financial statements more closely reflect the amount that could be obtained by selling the assets under current market conditions. Of course, it is possible to improve assets and hence increase their valuation. Accounting rules treat improvements in asset values in a special way. A reduction in value is treated as an expense called 'an impairment loss' whereas an increase in value is not treated as income. Instead the additional value is treated as credit transferred to a

‘revaluation reserve’. This is to prevent companies from generating misleading profits simply by adjusting the value of their assets.

Accounting standards require companies to revalue all their assets within the same class at the same time. Since this can be tedious in the case of machinery, companies usually only revalue assets such as land and buildings. Machinery, therefore, is mostly valued using the historical cost method.

Another way used to value assets is to estimate the cost of replacing the asset or acquiring an equivalent alternative. Once again, if the asset is not one that can be readily purchased on the open market, such as intellectual property resulting from research and development, then the historical cost method is often used instead. These assets are often called ‘intangible assets’.

Intangible assets and development costs

Intangible assets are identifiable, non-monetary assets that do not physically exist, such as patents, copyright, brand names, even Internet domain names. Since these assets are expected to generate economic benefits over several years, they are usually capitalised as explained earlier.

While development costs that are incurred with specific aim of producing an asset can be capitalised, research costs cannot be treated similarly. There is (perhaps) an implicit assumption that research is activity that is not specifically directed at a clearly defined end result. Therefore, research costs are treated as expenses which are recorded as they are incurred. Australian accounting standards, for example, require that an intangible asset that can be capitalised must meet the following conditions:

- It must be technically feasible to complete the intangible asset so that it is available for producing economic benefits or for sale.
- The entity (the company or organisation) intends to complete the intangible asset for producing economic benefits all for sale.
- The intangible asset is likely to generate future economic benefits: it must be possible to demonstrate that there is a market for the goods that are produced as a result.
- There are sufficient technical, financial and other resources to complete the development.
- The costs can be reliably measured.

Financial accounting and information limitations

Financial accounting is limited because it is only possible to record transactions, an exchange of money and goods. The transaction has to be documented so that there is evidence of the exchange that has taken place. Therefore, accounting is mostly their historical measurement system and records what has happened, not what could have happened.

Here lies a significant limitation. If there is a plant breakdown causing an interruption in production, then the company will usually not be able to earn revenue until the plant is back in operation, unless there is sufficient stock of unsold production to meet the demand in the meantime. Maintaining a significant stock, or inventory, is expensive and is therefore usually avoided. Therefore, in an extended shutdown, a company may have to acquire equivalent product from a competitor and perhaps sell it to customers at a loss. In the case of production losses that cannot be made up from inventory or by purchasing from competitors, the loss of income cannot be recorded by financial accounting.

For this reason and other similar reasons, companies also practice managerial accounting as an alternative means to measure their financial performance.

Traditionally, the field of accounting treats six business functions as components of a 'value chain' that add value to the organisation's products or services. These functions are research and development, design, production, marketing, distribution and customer service.

In order to monitor the performance of the organisation, managers need to understand the costs associated with each of these functions. Accounting accurately for costs is a major theme in managerial accounting.

A 'cost object', the fundamental component of company operation for which the cost needs to be known, can be a product, service, process or asset. Cost objects incur direct costs that can be linked with the origin of the object such as the cost of the materials contained within the object from which it has been made and the labour employed to make it. Indirect costs are incurred through the consumption of materials, energy or human effort necessary to obtain the 'cost object' but are not associated with 'traceable' components of the object. For example, material that is purchased to make the object but which is cut off and turned into waste material and subsequently discarded or recycled has to be treated as an indirect cost. When production mistakes occur, material may be 'spoiled' and products may require 'rework' to correct the mistakes. Both can be treated as indirect costs. People are also needed to supervise and coordinate the work required to make the object, but these people also supervise and coordinate other work at the same time. The cost of employing them, therefore, is accounted as an indirect cost.

Naturally, the extent to which costs can be traced and associated with a particular cost object depends on information technology. Therefore, the proportion of expenditure that can be treated as direct costs will depend on the ability of an organisation to identify and trace costs associated with a particular cost object.

Costs such as electricity supply, water supply, rent for floor space, maintenance and many consumables have to be treated as indirect costs because it is difficult or impossible to associate even a proportion of them with identifiable cost objects.

Accounting texts also discuss the concept of manufacturing overhead that includes indirect costs such as maintenance. In addition, downtime, idle time and associated lost production is also considered to be part of the manufacturing overhead. This includes the cost of paying labour for the time that they cannot actually produce anything. Idle time can also be caused by material shortages or components failing to arrive from suppliers in time. In practice, it can be very difficult to identify idle time costs. For example, while part of a plant may be shutdown, another part of the plant may be able to continue production and labour can be redeployed temporarily so that people have something productive to do. For example, production workers may be redeployed to cleaning and maintenance tasks, reducing the need for planned shutdowns to do this.

Activity based costing

It can be difficult to estimate the appropriate indirect cost associated with the cost object, a more practical method is to use a simple rule to allocate an indirect cost in proportion with the direct cost that can be estimated. Table 11.1 shows how indirect costs can be estimated in this way.

The top row of this table shows an example of the direct hourly cost of employing different kinds of labour, including 'on-costs' such as an allowance for leave, superannuation contributions, insurance payroll tax and so on. Indirect costs are estimated either as proportion of this hourly rate, or are given as an hourly rate in addition to the direct employment cost. Obviously, the actual indirect cost will vary from one type of work to another but it is often more effective to estimate indirect costs in this simple way. It is quicker and just as accurate in practice. One of the important judgements to be made in any organisation is the degree to which different indirect costs are identified calculated.

Typically in a production plant, the cost of operating the plant depends on the amount of product being manufactured or services delivered. Even when the plant is at a standstill, there will still be expenses incurred in order to keep the plant in a state such that production is possible. These costs are called 'fixed manufacturing costs', the component of manufacturing costs that does not depend on the production rate. 'Variable manufacturing costs' on the other hand are costs proportionate to the rate of production or service delivery.

Fixed manufacturing costs mostly consist of indirect costs. However, a proportion of indirect costs may appear as variable manufacturing costs if, for example, additional floorspace and production machinery is rented if production rises past the capacity of the existing floorspace.

Absorption costing

When a product is manufactured, the costs involved in its production are recorded as an inventory asset and then recorded as expenses when the product is sold. Absorption costing describes the widely used method in which both fixed and variable manufacturing costs are included as part of the inventory asset value which is capitalised.

Understanding incentives

Since maintenance is often seen as a cost rather than activity that at least maintains value, production capacity and prevents damage, there can be a temptation to defer maintenance and hence the associated expense. A manager that does this may be rewarded for improving financial performance even though there is a high risk of breakdown and lost production. The cost associated with these risks is transferred to a future time and does not influence the apparent financial performance. This is an example of financial incentives created inadvertently by accounting rules. That is why it is not possible to use managerial accounting as the only means of running an organisation. However, it can be difficult to argue for actions such as maintenance that appear to impair the financial performance of an organisation.

Another example comes from the mining industry. Managers recognised that responding to breakdowns was much more expensive than conducting planned preventative maintenance to prevent breakdowns, and hence interruptions to production. Therefore, they decided to reward supervisors for performing preventative maintenance. The supervisors responded by arranging with the maintenance workshop for breakdowns to be notified at the end of each working day. Repairs to fix the breakdowns were then classified as "planned maintenance", albeit planned for the following day. This way, they were able to achieve high apparent levels of planned maintenance and fewer breakdowns. The breakdowns were still occurring but were not recorded as breakdowns.

This is an example of how any attempt to measure the performance of an economic system that involves people in a way that later influences policy may no longer be a valid measurement. People respond policy by changing the way they record events.