MANAGEMENT ACCOUNTING – PERFORMANCE EVALUATION

John Joyce addresses the problem areas of overhead variances and planning variances.

Overheads

Every organisation needs to know the cost of providing the products or services that it delivers. (I will use the word "product" throughout the article, but the ideas always apply to "services" too.)

Some costs are easy to associate with the product: these are the direct costs. However, some costs are not linked directly to the product. For example, the insurance costs for a machine that produces a variety of products are not incurred directly as a result of producing one unit of a product.

Consequentially, the insurance costs of a production machine would be classified and recorded in the accounting system as "fixed production overhead". They are "fixed" because, in total, they will not change with number of units produced. Overheads that, in total, do vary in direct proportion to output are classified as "variable overheads".

This article is about production overheads but I will get fed up with constantly typing "production" and you will get fed up with reading it so I will do us both a favour and occasionally drop "production" from in front of "overhead" but please remember that we are talking about "production overheads".

Overhead absorption

Imagine that you have just set up a business that manufactures furniture. During the second week of operations, a customer calls to enquire about buying a table. Before you can quote a price, you need to ensure that the price you charge will cover all of the costs of producing the table. What is needed to manufacture the table? There are the materials and the labour: easy – these are the direct costs. But what about the production overheads? Now it gets tricky: you will not know the actual cost of many of the overheads and how many products they have to be shared between until the end of the year.

So, do you say to the customer:

"Sorry. I can't sell you a table today. Please call back at the end of my accounting year when I will then know the costs of my business for the year and I can then work out the cost of the table"?

Of course not! Instead you need to find a way of estimating the amount of overhead that a table will absorb. You will need to forecast the overhead costs and the total output.

Overhead absorption rates

Overhead absorption rates are our attempt at coming up with the best 'guess' of how much overhead should be given to a product. In traditional costing systems, the rates are likely to be based on machine hours or labour hours. The process is a little more refined in activity based costing, but the intention is still the same: we are trying to find an equitable way of sharing out the overheads to products and are therefore looking for a method that relates the absorption base to the incidence of the overheads (establish a 'causal link'). If a business is machine intensive, machine hours would be the most appropriate base as the overheads would be related to machine usage. But this is taking a very wide view: it would be better to break the business down into separate departments and choose individual rates for each department.

Activity based costing refines this process and, instead of looking at the overheads of departments, it records the costs of similar activities together in cost pools and then absorbs these costs by using the activity that drives the cost as the absorption rate.

In order for the business to move along and not wait a full year before it can sell its products we need to forecast the overheads and forecast the total hours to be used when making all of our products (assuming a traditional system), in other words we work with budgeted figures when calculating the overhead absorption rates.

The formula to use is:

Overhead absorption rate = budgeted overhead/budgeted base

Standard costing
CIMA Terminology defines a "standard" as:

"Benchmark measurement of resource usage or revenue or profit generation, set in defined conditions."

Every product will have a standard cost card (standard product specification) which states:

"…the standard inputs required for production as well as the standard selling price. Inputs are normally divided into labour, material and overhead categories, and both price and quantity information is shown for each" (CIMA Terminology).

Therefore in a standard absorption costing system the standard cost card for each product will show the amount of fixed overhead to be absorbed by that product. The card will show the direct costs and the overheads to be charged to each unit of production. Each of the costs will be broken down into the standard quantity and standard price information.

For example, the fixed overheads to be charged to each unit of the product will be broken down into standards for quantity and price: the number of machine hours and the associated overhead absorption rate per machine hour (assuming that machine hours have been chosen as the most appropriate base).

Example
A company manufactures one type of product. The company uses a standard absorption costing system and absorbs production overheads based on machine hours.

The budgeted details for the last year were as follows:

Output	2,000 units
Variable overheads	$6,000
Fixed overheads	$4,500
Machine hours	0.25 hours per unit

The total budgeted number of machine hours was 500 hours (2,000 * 0.25). We can now calculate the variable and fixed overhead absorption rates and show the standard cost card.

Variable overhead absorption rate = $6,000/500 = $12 per machine hour.

Fixed overhead absorption rate = $4,500/500 = $9 per machine hour.

Standard cost card per unit		**$**
Variable overhead	0.25 hours @ $12 per machine hour	3.00
Fixed overheads	0.25 hours @ $9 per machine hour	2.25

At the end of the year the **actual** figures were:

Output	1,900 units
Variable overheads	$5,750
Fixed overheads	$4,800
Total machine hours	513 hours

Calculation of variances
There are formulas for calculating variances that you can try to remember but it is far better if you can think about what is happening and then this insight will give you a long-lasting understanding of the situation. There is every possibility that you will forget a formula in an exam but there is much less chance that you will lose your ability to think!

Variable overhead expenditure variance
This is the difference between what we actually spent and what we think we should have spent on variable overheads. It is important to realise that the variable overhead expenditure variance relates to a variable item (that is why it has "variable" in the title!) and therefore as with all variable items we need to flex levels so that appropriate planning and control information is used.

So, if we knew we were going to work 513 hours we would have expected (based on the standard) to have spent 513 * $12 = $6,156. We actually spent $5,750 and therefore the variance is $406 favourable.

Variable overhead efficiency variance
As the name explicitly states this is about how efficient we have been. We used 513 machine hours to make 1,900 units. The standard cost card shows that each unit should use 0.25 hours per unit and therefore 1,900 units should have taken 475 hours. We have used 38 hours more than we should have done to produce the output of 1900 hours (and therefore the variance will be adverse).

Now think back to what we are calculating: the variable overhead efficiency variance. This then tells you how to value those hours. They are valued at the variable overhead absorption rate of $12 per hour. Therefore the variable overhead efficiency variance is 38 hours * $12 per hour = $456 adverse.

Fixed overhead variances
The syllabus content shows that the only variances that are examinable for fixed overheads are the total, expenditure and volume ones. In terms of your studies this immediately flags up a very important fact for you: the actual hours taken are totally

irrelevant when calculating these three variances! To calculate these variances you only need three figures: the actual expenditure, the budgeted expenditure and the absorbed overheads (which will be calculated by using the standard allowance for the actual number of units produced).

Fixed overhead expenditure variance

Let's think about this! Why are fixed overheads called fixed overheads? Answer: because they are fixed! We expect the amount that we should spend on them to be fixed and therefore not to vary with output. Unlike with a variable item, you do not flex the budget with output: it is fixed. Consequently, the fixed overhead expenditure variance is the difference between what we actually spent and the budgeted fixed overheads. In this example it is $300 adverse.

Fixed overhead volume variance

Again, simply looking at the name of the variance tells us what it is about. This is about the variance caused by the output volume being different from that budgeted. The budgeted volume was 2,000 units and the actual output was 1,900 units. We have made 100 units less than we intended to and therefore the variance is adverse. We need to put a monetary value on this and therefore each unit value is valued at the standard fixed overhead cost of $2.25 unit. The fixed overhead volume variance is $225 adverse.

You could have calculated the monetary value by stating that each of the units needs 0.25 machine hours and the fixed overhead absorption rate is $9 per machine hour and therefore the variance is 100 * 0.25 * 9 = $225 adverse.

Total fixed overhead variance

The total fixed overhead variance can be calculated by adding the fixed overhead expenditure and volume variances together.

Alternatively you can get there quicker by realising that it is the difference between the actual fixed overheads and the fixed overheads absorbed by the output. This is exactly the same as the under or over absorbed overhead.

It is important that you remember that in a standard absorption costing system the amount of overhead absorbed is calculated using the standard content of the actual output (actual hours are not used).

The CIMA Terminology defines the fixed production overhead total variance as:

*"the difference between the fixed production overhead absorbed by actual production and the actual fixed production occurred. ((actual production in standard hours * fixed production overhead absorption rate per hour) – actual fixed production overhead)"*

However we don't need to memorise the formula – we can think our way to the answers!

There is an exam question to work through on pages 4 and 5 of this article.

Hopefully you will now have a clear understanding of how to calculate these variances and can now see that a little thought will quickly earn you some marks in the exams. Good luck!

This article is dedicated to the memory of Herbert F Kornfeld (1972-2007)

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To reinforce your learning, do (as Yoda said *"Do. There is no try."*) this exam question:

Exam question P1 May 2008
A company uses a standard absorption costing system and the fixed overhead absorption rate is based on labour hours.

Extracts from the company's records for last year were as follows:

Company records	**Budget**	**Actual**
Fixed production overhead	$450,000	$475,000
Output	50,000 units	60,000 units
Labour hours	900,000	930,000

The under- or over-absorbed fixed productions overheads for the year were:

A $10,000 under
B $10,000 over
C $15,000 over
D $65,000 over

Immediately you should think this is easy! All you need are the actual expenditure (which is given as $475,000) and the amount of overheads absorbed.

Which ever way you answer this question the first thing to do is ignore the 930,000 hours that were actually worked. That figure is totally irrelevant. The examiner has put it there to find out who really knows what they are doing!

The long way to the answer:
The fixed over head absorption rate is $450,000/900,000 hours = $0.50 per hour

The standard time per unit is 900,000/50,000 = 18 hours per unit.

Therefore the standard cost card per unit would show:

Fixed production overhead: 18 hours @ $0.50 per unit = $9.00

We can now work out how much overhead has been absorbed by the output of 60,000 units.

60,000 units should use 60,000 * 18 = 1,080,000 hours

Each hour absorbs $0.50 of fixed overheads and therefore 1,080,000 hours will absorb $540,000.

The actual fixed production overheads were $475,000 and therefore we have over absorbed by $65,000.
The answer is D.

The quick way to the answer:
Each unit of production should absorb $9 of fixed overheads ($450,000/50,000 units) and therefore the output of 60,000 units will absorb $540,000. This is then compared to the actual figure of $475,000 to give the answer of "$65,000 over absorbed". Easy!!!!

By understanding these methodologies you should be able to see that you can always opt for the short cut method to calculate the absorbed fixed production overheads. When you see a question such as this the only figures that you need are the budgeted overheads and budgeted units, and the actual overheads and the actual output. Everything else (and that includes the base to be used for the absorption rate and the actual hours worked) is superfluous.

Planning variances

A common mistake made by students is that they forget to "flex" when calculating planning variances for variable elements.

Let's build up our understanding of this by looking at the following scenarios.

Scenario 1
A company operates a JIT purchasing and production system. The budgeted output for the last period was 1,000 units of Product X.

The standard cost for one unit of Product X shows the following details for direct materials:

Direct materials: 3 kg @ $5.80 per kg = $17.40

During the last period the company purchased and used 2,800 kgs for $18,200 to produce 900 units of Product X.

The total direct material variance is $15,660 - $18,200 = $2,540 adverse.

This can be broken down into a price variance of $1,960 adverse and a usage variance of $580 adverse.

Scenario 2
The same information as above but now the standard cost card shows:

Direct materials: 3 kg @ $6.75 per kg = $20.25

The total direct material variance would now be $18,225 - $18,200 = $25 favourable

This can be broken down into a price variance of $700 favourable and a usage variance of $675 adverse.

Comparing the scenarios
If we look at the total variances calculated in each of the scenarios we can see that the total variance changed from $2,450 adverse to $25 favourable.

What caused the change?

Yes, the standard changed!

More specifically the standard price changed from $5.80 per kg to $6.75 per kg. For the actual output of 900 units of Product X this has resulted in our expected costs rising by $2,565 (a variance of $2,565 adverse).

This information could be dressed up into an exam question whereby **Scenario 1** was given as the original budget and standards, and then you were told that a shortage of materials has caused the market price to rise to $6.75. You would then be asked to calculate the planning and operational variances.

The planning variance is the difference between the two total variances and the operational variances would be the variances we calculated for **Scenario 2**.

There is a quicker way to calculate the planning variance. The price has risen by $0.95 per kg. The output was 900 units of Product X. Each unit should use 3 kg.

The planning variance is therefore 900 * 3 * 0.95 = $2,565. The price of the material has risen and therefore the variance is adverse.

Notice that the budgeted output of 1,000 units of Product X does not enter into the calculations. Materials are a variable cost and therefore the volume must be flexed to the actual output.

Time for some practice! Have a go at this recent exam question:

Exam question P1 May 2008 (edited)
FX produces one type of product. Budgeted sales and output are 1,000 units per month. The standard unit cost card included:

Direct material (5 kg @ £20 per kg) £100

Month 6
The company has just completed Month 6 of its operations. Extracts from its records show:

1. 1,200 units were produced and sold.

2. The actual direct materials purchased and used were 6,300 kg costing £132,300

The Managing Director has discovered that a shortage of materials had caused the market price to rise to £23 per kg.

In view of this information you are required to calculate for the direct material:

- The total variance
- The planning variance
- The two operational variances

Answer:
When you are working on your answers the important figures are the actual output of 1,200 units and the original and revised standards (the budget of 1,000 units is totally irrelevant).

The total variance
This is the difference between the original standard cost of 1,200 units and the actual cost. This is £12,300 adverse. (1,200 units should cost £120,000 but they did cost £132,300)

The planning variance:
This is the difference between the original standard cost of 1,200 units and the revised standard cost of 1,200 units. The cost of the material has risen by £3 per kg.

The planning variance is therefore 1,200 * 5 * 3 = £18,000 adverse.

The operational variances
These are the operational price and usage variances and will be calculated using the revised standard cost per unit of 5 kg @ £23 per kg = £115.

Price variance = £12,600 favourable (6,300 kg should cost 6,300 * 23 = £144,900. They did cost £132,300)

Usage variance = £6,900 adverse (1,200 units should use 6,000 kg, but did use 6,300 kg. We are therefore 300 kg adverse and these are valued @ £23 per kg)

Check: total variance = planning variance + operational variances £12,300 adverse = £18,000 adverse + £12,600 favourable + £6,900 adverse