COST ACCOUNTING AND QUANTITATIVE ANALYSIS

Foundation stage
December 2002

MARKING SCHEME

CIPFA

Question 1

(a) **Role of cost/management accountant cf financial accountant**

Cost/management accountant	*Financial accountant*
Help plan (produce budgets)	Produce financial accounts
Control	Check for accuracy etc
Monitor performance	Audit duties
(budget monitoring reports)	Produce p&l and b/sheet
Establish cost behaviour	Calculate profit or loss
Produce cost and management a/cs	

The above list is not meant to be exclusive. Credit should be given for other valid comparisons between role of cost/management accountant and financial accountant. But NB question does not ask for differences between cost/management accounting and financial accounting per se. So answers saying (eg) that financial accounts are for external use (cf internal use for cost accounts) are not answering the question asked.

(Limit maximum marks to 3 out of 6 if this happens)
(6)

(b) **Problems if no internal accounting support?**

- They do not know if trading at a profit or loss?
- Presumably little in the way of stock records or stock control?
- No cost information to help decide prices?
- Little in way of systems/records/accounts etc (they lose information!) How do they satisfy (say) Inland Revenue (for tax purposes?) and information for end of year accounting purposes?
- They will suffer from having no plans/budgets/costings/etc and will operate less efficiently and wastefully.

Again, not an exclusive list of points which can be made, but would expect a reasonable answer to come up with mostly similar points.

(1 mark for each problem, up to a maximum of 4)

(c) **Degree of correlation**

	X		Y	X^2	XY	Y^2
£	£000	Units	Units 000			
1,000	1.0	1,700	1.7	1.0	1.7	2.89
2,000	2.0	3,000	3.0	4.0	6.0	9.00
5,000	5.0	1,200	1.2	25.0	6.0	1.44
8,000	8.0	15,000	15.0	64.0	120.0	225.00
10,000	10.0	14,000	14.0	100.0	140.0	196.00
25,000	25.0	28,000	28.0	625.0	700.0	784.00
51,000	51.0	62,900	62.9	819.0	973.7	1,218.33

2

Correlation coefficient

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left(n\sum x^2 - \left(\sum x\right)^2\right)}\sqrt{\left(n\sum y^2 - \left(\sum y\right)^2\right)}}$$

$$r = \frac{6x973.7 - 51x62.9}{\sqrt{(6x819) - 51x51}\sqrt{(6x1,218.33) - 62.9x62.9}}$$

$$r = \frac{5,842.2 - 3,207.9}{\sqrt{(4,914) - (2,601)}\sqrt{(7,309.98) - (3,956.41)}}$$

$$r = \frac{2,634.3}{\sqrt{(2,313)x(3,353.57)}} \quad r = \frac{2,634.3}{\sqrt{7,756,807.4}}$$

$$r = \frac{2,634.3}{2,785.10}$$

r = 0.946

2

Comments:

Strong positive relationship (+ 0.946)
Seems therefore to be high degree of correlation between spend on advertising and resultant sales *2*

Assumptions:

Assumes relationship is causal. That is the increase in spending *causes* the increase in sales rather than the other way round. (Could actually be coincidence). Might be true for *these* figures for *these* companies but not necessarily true for Dawson Supplies – might also not be true for future. Assumes all other factors stay same/have little influence eg world markets, customer demands, economic factors etc. *2*

(8)

(d) NB a small sample so "t" test. *1*
µ = x ± t (SE)

$$SE = \frac{s}{\sqrt{n}} \qquad SE = \frac{8{,}780.66}{\sqrt{6}} \qquad = 3{,}584.69$$

2

At 95% confidence the value of t from tables is 2.571
(NB the number of degrees of freedom is 6 less 1 ie 5 df) *1*

So µ = £8,500 ± 2.571 x 3,584.69

µ = £8,500 ± £9,216

Therefore statistically the sampled 6 values suggest 95% confidence limits for the population mean ranging from;
- £716 to + £17,716. *1*

Comment :

Although statistically the confidence limits calculates as –716 to + 17,716, the actual figures relate to advertising *spending* and of course negative spend on advertising is not possible. *1*

(6)

(e) **99% confidence limits**

If 99% confidence is required then the range of values becomes *wider* compared with 95% confidence limits. *(1)*

(25)

Question 2

(a) **Present predetermined (blanket) overhead absorption rate.** NB using direct labour *cost* as base.

Budgeted overhead ÷ budgeted base (labour cost) = £110,000 ÷ £440,000 *1*

= 25% (or £0.25 per £1 of labour cost) *1*

(2)

(b) **Production cost of Job XYZ:**

		£	
Direct materials	£500+£100+£100	£700	½
Direct labour	£200+£400+£100	£700	½
Production overhead : 25% x £200	£50		½
25% x £400	£100		½
25% x £100	<u>£25</u>	<u>£175</u>	½
TOTAL PRODUCTION COST		£1,575	½

(3)

(c) **Over/under absorption (using blanket rate– direct labour cost basis)**

Department	Overhead absorbed		Actual cost	Under/over	
	(using 25% x labour cost)	£	£	£	
Machining	25% x £240,000	60,000	24,000	36,000 over	*1*
Assembly	25% x £ 180,000	45,000	50,000	5,000 under	*1*
Finishing	25% x £44,000	11,000	40,000	29,000 under	*1*
TOTALS		116,000	114,000	2,000 over	*1*

(4)

(d) **Advantages and disadvantages of individual departmental absorption rates.**

Advantages:
- Can choose a basis reflecting more closely how department works/overhead costs incurred.
- Ought therefore to result in less under/over absorption and more accurate overhead absorption.
- Departmental managers might feel more motivated/in control if involved in choice of base to use.

Disadvantages

- Administratively more complex and perhaps costly/time consuming.
- Needs information and costing systems to record eg machine hours and labour hours.

1 for each advantage, up to a maximum of 2
1 for each disadvantage, up to a maximum of 2
(4)

(e) **Individual departmental overhead absorption rates.**

Machining department.

The estimated number of machine hours is twice as many as labour hours. Also the name of the department suggests a machine intensive operation and so machine hours as an absorption base is the most likely.

Budgeted overhead ÷ budgeted base (machine hours)
= £20,000 ÷ 100,000 machine hours = £0.20 per machine hour *1*

Assembly department.

The estimated number of labour hours is twice as many as machine hours. The name of the department does not give any real indication of the kind of operation but assuming labour intensive then labour hours as an absorption base is probably the most likely.

Budgeted overhead ÷ budgeted base (labour hours)
= £40,000 ÷ 20,000 labour hours = £2 per labour hour *1*

Finishing department.

The choice of absorption base is comparatively clear cut here. No machine hours are used so the finishing work must be carried out by hand. A labour based absorption base should therefore be used. It is technically possible to use labour *cost* (the same basis as the present blanket rate). This would mean a charge out/absorption rate of 125% or £1.25 per £1 of labour cost (£50,000 ÷ £40,000). However, using cost as a base can distort where disparate wage rates exist. More usual is to use a time based method (ie labour hour rate).

Budgeted overhead ÷ budgeted base (labour hours)
= £50,000 ÷ 10,000 labour hours = £5 per labour hour *1*

Production cost of Job XYZ (using individual departmental rates)

		£	
Direct materials	£500+£100+£100	£700	
Direct labour	£200+£400+£100	£700	
Production overhead : £0.20 x 70 m hrs	£14		½
£2 x 50 lab hrs	£100		½
£5 x 30 lab hrs	£150	£264	½
TOTAL PRODUCTION COST		£1,664	½

(5)

(NB If Labour Cost is used as the absorption base for Assembly and Finishing departments then credit should be given).

(f) **Under / over absorption (using individual departmental rates)**

Department	Overhead absorbed		Actual cost	Under/over
	(using individual rates)	£	£	£
Machining	£0.20 x 98,000 m hrs	19,600	24,000	4,400 under
Assembly	£2 x 24,000 lab hrs	48,000	50,000	2,000 under
Finishing	£5 x 10,000 lab hrs	50,000	40,000	10,000 over
TOTALS		117,600	114,000	3,600 over

3

Comments: The overall under/over absorption is slightly worse than the blanket rate but the individual department under/over amounts are much closer. *1*

(4)

(g) **Definitions of terms**
(per Section 15.2 of open learning material)

Histogram: A chart showing a grouped frequency distribution by a set of vertical bars or columns whose areas are proportional to the frequencies represented. *1*

Frequency polygon: A chart in which straight lines are used to join the mid points of the class intervals. *1*

Ogive: The depicting of a frequency distribution by a cumulative frequency curve. *1*

(3)

(25)

Question 3

(a) **Difference between payroll accounting and labour cost accounting**

Payroll accounting: concerned with ensuring workers are paid the correct amount, that correct deductions are made with regard to National Insurance/Pensions etc, that Income Tax calculations are correct, that information regarding hours worked/overtime/bonuses etc is correct and so on. *2*

Labour cost accounting: concerns the cost of labour to the organisation and looks at time spent on jobs/contracts/pieces of work/products and establishes productive and non-productive time so that charge out rates/prices can be ascertained. *2*

(4)

(b) **Calculation of productive labour hour rate**

Paid time:
The organisation pays 5 technicians for a 40 hour week over 52 weeks. The pay rate is £10 per hour.

Ie 5 x 40 x 52 x 10 = **£104,000** *2*

Productive hours

The 5 technicians have 6 weeks leave so work 46 weeks	5 x 46 x 40hrs = 9,200hrs	*1*
But 4 hours per week are lost due to machine cleaning/calibration. This occurs each week of the year. So in each of the 46 working weeks, 4 hours are lost.	*Less* 5 x 4hrs x 46 = 920hrs	
	8,280hrs	*1*
Also lose time due to sickness, training and union meetings. It could perhaps be argued that some of this time might coincide/overlap with the cleaning/recalibration time but as a charge out rate is being calculated it is best to assume the worst case where maximum lost time occurs (5 days = 1 week lost)	*Less* 5 x 1 week x 40hrs = 200hrs	
TOTAL PRODUCTIVE HOURS	8,080hrs	*1*

So Productive Direct Labour Hour Rate is ÷ £104,000 ÷ 8,080 hrs = £12.8713 per hour. As this is a charge rate it should be rounded up. So use £12.88 per labour hour. *1*

(6)

(c) **Expected value**

The expected outcome of an event/several events is called the expected value (EV). If the probability of an outcome is p, then the expected number of times that this outcome will occur in n events (the EV) is given by n x p. Thus the expected value of the event is its probability times the outcome or value of the event over a series of trails. *2*

It has to be assumed that:

- The probabilities are correct
- The EV is what is likely to occur *over a long run series of trails.* It is not a prediction of what will actually happen next time.
- It is quite possible that the EV works out to be a value which is not possible. (In this case the EV for the materials cost is £3,600 which is not one of the given possible values).
- The organisation's attitude to risk needs to be considered.
- The range (and skewness) of possible outcomes is ignored.

½ for each assumption, up to a maximum of 2

(4)

(d) **Evaluation of the two possible contracts**

	Contract A		**Contract B**	
Direct labour costs	£		£	
(200hrs x £12.88)	2,576			½
(100hrs x £12.88)			1,288	½
Direct Materials				
(50% x 4,000 + 30% x 2,000 + 20% x 5,000)	3,600			*1*
£4,000			4,000	
Oncosts (25%)	1,544	½	1,322	½
TOTAL COSTS	7,720		6,610	
CONTRACT PRICE/VALUE	7,500		7,000	
POSSIBLE PROFIT/SURPLUS	(220)	½	390	½

Comments and advice for management:

- Using the EV for materials on Contract A results in a deficit/loss.
- Contract B however results in a surplus/profit.
- NB on A if materials cost £4,000 then loss is (£720). If cost is £5,000 then loss is (£1,970).
- Only if materials cost £2,000 does A make a surplus - £1,780 (NB only 30% chance!)
- As two **new** contracts this assumes there is spare capacity? (possible opportunity costs?)
- Might be thought that Contract A could lead to further work in the future and thus should be accepted even with small deficit (ie loss leader).
- From purely financial standpoint accept B but reject A.

1 for each valid point, up to a maximum of 4

(8)

(e) **Group incentive bonus schemes**

Disadvantages:

- As a **group** bonus scheme there is the problem of rewarding members of the group equally when amount of effort/work/time etc might not be the same – and therefore de-motivational effects which can follow.
- Any bonus scheme which presumably encourages greater/faster production can potentially suffer from quality problems (thus needs quality control systems built in).
- Again as with any bonus scheme there will need to be systems in place to record times/outputs etc (which may cause both initial extra set up costs and/or extra running costs).
- Quite often with incentive bonus schemes there is an initial improvement in productivity/output which then levels out over time. There might be a need to re-assess/review the scheme after it has been in operation for a while.

1 for each disadvantage, up to a maximum of 3

(25)

Question 4

(a) Bruce Transport

Table of operating costs for last year ½

		SINGLE			DOUBLE	
		12 vehicles	÷600,000km		6 vehicles	÷300,000km
		Total cost	£ per km		Total cost	£ per km
Running costs						
Drivers						
Basic	½	240,000	0.40		120,000	0.40
Overtime	½	12,000	0.02		6,000	0.02
Pension	½	24,000	0.04		12,000	0.04
Bonus	½	0	0.00		3,000	0.01
Other running costs						
Fuel	½	60,000	0.10		40,000	0.13
Tyres	½	120,000	0.20		90,000	0.30
Repairs* - Wages	½	20,000	0.03		10,000	0.03
Materials	½	16,000	0.03		8,000	0.03
Overheads						
Licences	½	12,000	0.02		9,000	0.03
Insurance	½	48,000	0.08		36,000	0.12
Depreciation	½	72,000	0.12		72,000	0.24
Notional interest	½	36,000	0.06		36,000	0.12
Central costs*	½	160,000	0.27		80,000	0.27
TOTALS		½ 820,000	½ 1.37		½ 522,000	½ 1.74

NB *Repair costs (both wages and materials) have been apportioned between the two types of vehicle in proportion to the number of vehicles ie 2/3:1/3. This also reflects distance travelled. Thus both routine and distance related maintenance will be reflected. A similar approach was adopted for the Central Support costs. *1*

(10)

(b) **Comparison with target cost.**

NB target cost is £1.50 per km. Single decker costs are £0.13 (8.7%) within this, but double deckers exceed this by £0.24 per km, (16%).

1 for each comparison, up to a maximum of 2

Comments:

- The cost per kilometre for double deckers is 27% higher than single deckers (£1.74 per km cf £1.37 per km).
- Main causes are tyre costs and also the overheads (50% - 100% higher).
- Repair costs and Central Support costs are dependent on basis of apportionment chosen.
- The special bonus is presumably a "one-off " cost which will not recur. (But this only accounts for £3,000 - £0.01 per km and thus still over target with this one-off cost removed).
- What scope is there to replace double deckers by the apparently cheaper single deckers? (Capacity issues? Frequency issues?)

1 for each valid point, up to a maximum of 3
(5)

(c) **Journey Time probabilities**

Average journey time is said to be 3 hours 35 minutes. (= 215 minutes).
(population mean μ)

Standard deviation of journey times is given as 15 minutes.
(population standard deviation s)

(i) Probability that journey takes longer than 4 hours (ie 240 minutes).

Standardised variate Z $= (x - \mu) \div s$ $= (240 - 215) \div 15$

$= 1.667$ std deviations. *1*

From normal distribution tables, value is 0.0478
So probability that journey is greater than 4 hours is **0.048** (rounded) or can say that **4.8%** of journeys greater than 4 hours. *2*

(ii) Probability that journey takes less than 3 hours (ie 180 minutes).

Standardised variate Z $= (x - \mu) \div s$ $= (180 - 215) \div 15$

$= 2.333$ std deviations. *1*

From normal distribution tables, value is 0.0099.
So probability that journey is less than 3 hours is **0.0099** (rounded to just under 1%) so can say that **1.0%** of journeys less than 3 hours. *2*

(6)

(d) **Time Series models**

Components of a time series :- T = Trend
S = Seasonal variations
C = Cyclical variations
R = Residual (Random) variations.

Additive model - T + S + C + R *1*
Components expressed as absolute amounts *1*

Multiplicative model - T x S x C x R *1*
Components expressed as percentages or proportions (so eg seasonal factors increase over time). *1*

(4)

(25)

Question 5

(a) Material price variance:
(SP – AP) AQ
Filling 4,200kg (£5 - £5.20) = £840 ADV.
Pastry 2,500kg (£2 - £1.90) = £250 FAV.

Material usage variance:
(SQ – AQ) SP
Filling (4,000 kg – 4,200 kg) @ £5 = £1,000 ADV.
Pastry (2,400 kg – 2,500 kg) @ £2 = £200 ADV.

Material cost variance:
(SC – AC)
Filling (4,000kg @ £5 – 4,200kg @ £5.20) = £1,840 ADV.
Pastry (2,400kg @ £2 – 2,500kg @ £1.90) = £50 FAV.

Labour rate variance:
1,700hrs (£9.50 - £10) = £850 ADV.

Labour efficiency variance:
(1,600 hrs. – 1,700 hrs) @ £9.50 = £950 ADV.

Labour cost variance:
(1,600hrs @£9.50) - £17,000 = £1,800 ADV.

1 mark each for variance

(9)

(b) Comments on findings:

- Normal production is 100,000 per month yet only 80,000 were made this month. Management need to investigate why production was down.

- One cause of variances is that standards have become wrong/outdated. This needs to be checked.

- Main adverse variances are on Filling (both Price and Usage) and on Labour Rate and Efficiency. This needs examining. Why for example was it necessary to pay 50p per hour more than standard? If permanent, then standard will need adjusting.

- For pastry the Price variance is favourable but the Usage variance is adverse. This could perhaps suggest quality issues with the material being purchased cheaply but inferior quality meaning more is used or wasted.

(1 mark per comment up to maximum of 4 marks)

(c) Possible cause of variances:

Materials Price Variance	**Materials Usage Variance**
Price increase/decrease(inflation)	(In) Efficiency of workers
Discounts (bulk buy)	Machine related (eg breakdowns)
Change of materials	Change of methodology/specification
Change of supplier	

NB other possible valid causes should be given credit.
(½ mark for each possible cause up to maximum of 3 marks)

(d) Calculation of mean and standard deviation.

	X	$X - \overline{X}$	$(X - \overline{X})^2$
	Thousands		
	4.0	-0.1	0.01
	4.1	0.0	0.00
	4.4	0.3	0.09
	3.9	-0.2	0.04
	4.0	-0.1	0.01
	4.2	0.1	0.01
TOTAL	24.6		0.16

Mean value is 24.6 ÷ 6 = 4.1 ie 4,100 kg

Standard Deviation $s = \sqrt{\sum (X - \overline{X})^2 / N}$

$= \sqrt{0.16/6} = 0.1633$

So standard deviation is 163.3 kg away from the mean of 4,100kg.

(4)

*Note: 4 marks are available in total for this section. For full marks, answers must clearly label the calculated numbers eg 4.1 or 4,100 for the mean is not sufficient. The standard deviation likewise must be correctly expressed as 163.3**kg**. The six values could be treated simply as a "population" (and thus divide by N). It could also be assumed that these six results are in fact a sample from a larger population of results and in that case divide by N – 1 is possible (but NB only when using the sample as an indicator of the population standard deviation. The result becomes 178.9kg. Any answer where this approach has been used needs to explain and justify the assumptions).*

(e) Characteristics of a normal distribution.

- Continuous frequency distribution.
- Symmetrical bell-shaped curve.
- Approaches but never touches the X axis.
- Mean, median and mode coincide.
- Shape defined/described by mean and standard deviation.
- 68% of values/observations within 1 SD of the mean (95% = 1.96SD's, 99%= 2.58SD's) etc.

(NB 1 mark for each characteristic described up to a maximum of 5 marks)

(25)