



Performance Pillar

P2 – Performance Management

Wednesday 29 February 2012

**Instructions to candidates**

You are allowed three hours to answer this question paper.
You are allowed 20 minutes reading time <b>before the examination begins</b> during which you should read the question paper and, if you wish, make annotations on the question paper. However, you will <b>not</b> be allowed, <b>under any circumstances</b> , to open the answer book and start writing or use your calculator during this reading time.
You are strongly advised to carefully read ALL the question requirements before attempting the question concerned (that is all parts and/or sub-questions).
ALL answers must be written in the answer book. Answers written on the question paper will <b>not</b> be submitted for marking.
You should show all workings as marks are available for the method you use.
ALL QUESTIONS ARE COMPULSORY.
Section A comprises 5 questions and is on pages 2 to 4.
Section B comprises 2 questions and is on pages 6 to 9.
Maths tables and formulae are provided on pages 11 to 14.
The list of verbs as published in the syllabus is given for reference on page 15.
Write your candidate number, the paper number and examination subject title in the spaces provided on the front of the answer book. Also write your contact ID and name in the space provided in the right hand margin and seal to close.
Tick the appropriate boxes on the front of the answer book to indicate which questions you have answered.

**P2 – Performance Management**

TURN OVER

## SECTION A – 50 MARKS

[You are advised to spend no longer than 18 minutes on each question in this section.]

ANSWER ALL FIVE QUESTIONS IN THIS SECTION. EACH QUESTION IS WORTH 10 MARKS. YOU SHOULD SHOW YOUR WORKINGS AS MARKS ARE AVAILABLE FOR THE METHOD YOU USE.

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### Question One

A company has developed a new product which it will launch next month. During the initial production phase the company expects to produce 6,400 units in batches of 100 units. The first batch to be produced is expected to require 25 hours of direct labour. The following details are expected to apply throughout the initial production phase:

- Direct material cost per unit is expected to be \$4
- Direct labour is to be paid \$10 per hour
- A 90% learning curve is expected to apply
- Other variable costs are expected to be \$2 per unit

Note: The learning index for a 90% learning curve is -0.1520

*Required:*

- (a) **Calculate** the total variable cost of the 6,400 units of the new product.

*(4 marks)*

You have shown your calculation to the Finance Director who has now told you that the company needs to achieve a total variable cost target of \$45,000 for the first 6,400 units in order to achieve its initial production phase profit target.

- (b) **Calculate** the rate of learning at which the initial production phase profit target would be achieved, assuming no other cost savings can be made.

*(6 marks)*

*(Total for Question One = 10 marks)*

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## Question Two

SD manufactures and sells a small range of timber products. The main differences between the products are their size and the type of timber used. SD prepares annual budgets and sets a standard cost for each different product at the start of each year. Variance reports are produced every month.

Recently, there have been significant differences between the actual costs and standard costs of the products manufactured.

SD recently introduced a system of Kaizen Costing which has resulted in changes to the methods used to manufacture the timber products.

Some of the directors have suggested that the use of standard costs as a means of monitoring performance is no longer appropriate and that the monthly variance report is meaningless.

*Required:*

- (a) **Explain** the principles of Kaizen Costing. (4 marks)
- (b) **Discuss** how SD can use standard costing and variance analysis to prepare meaningful reports when using Kaizen Costing. (6 marks)

*(Total for Question Two = 10 marks)*

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## Question Three

MLC, which was established in 1998, manufactures a range of garden sheds and summerhouses using timber purchased from a number of suppliers.

The recently appointed managing director has expressed increasing concern about the falling sales volumes, rising costs and hence declining profits over the last two years.

*Required:*

**Discuss** how business process re-engineering could help to improve the profits of MLC.

*(Total for Question Three = 10 marks)*

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*Section A continues on the next page*

TURN OVER

#### Question Four

A transport company is preparing its cost budgets for the coming year. It has been set both social objectives and cost targets by the government which it must achieve in order to receive a subsidy. Part of the subsidy is paid when acceptable budgets have been submitted to the government's transport office and the balance is payable at the end of the year provided the company has achieved its social objectives and cost targets.

The first draft of the cost budgets has been completed and submitted to the budget committee.

*Required:*

**Explain** to the Board of Directors how (i) feedforward control and (ii) feedback control should be used in the transport company. (You should use examples from the company's budgeting system in your answer.)

*(Total for Question Four = 10 marks)*

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#### Question Five

A college currently measures its performance by comparing its actual costs against its budgeted costs for the year. Now that the college is facing increased competition from other colleges and private education providers, one of its professors has suggested that it needs to consider additional performance measures such as those indicated by the Balanced Scorecard.

*Required:*

(a) **Explain** the concepts of the Balanced Scorecard and how this approach to performance measurement could be used by the college.

*(6 marks)*

(b) **Explain** TWO non-financial measures (chosen from different perspectives of the balanced scorecard) that the college could use to measure its performance.

*(4 marks)*

*(Total for Question Five = 10 marks)*

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*(Total for Section A = 50 marks)*

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*End of Section A*

*Section B starts on page 6*

TURN OVER

## SECTION B – 50 MARKS

[You are advised to spend no longer than 45 minutes on each question in this section.]

ANSWER *BOTH* QUESTIONS IN THIS SECTION. EACH QUESTION IS WORTH 25 MARKS. YOU SHOULD SHOW YOUR WORKINGS AS MARKS ARE AVAILABLE FOR THE METHOD YOU USE.

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### Question Six

JRL manufactures two products from different combinations of the same resources. Unit selling prices and unit cost details for each product are as follows:

<i>Product</i>	<i>J</i> \$/unit	<i>L</i> \$/unit
Selling price	115	120
Direct material A (\$10 per kg)	20	10
Direct material B (\$6 per kg)	12	24
Skilled labour (\$14 per hour)	28	21
Variable overhead (\$4 per machine hour)	14	18
Fixed overhead*	28	36
Profit	13	11

\*Fixed overhead is absorbed using an absorption rate per machine hour. It is an unavoidable central overhead cost that is not affected by the mix or volume of products produced.

The maximum weekly demand for products J and L is 400 units and 450 units respectively and this is the normal weekly production volume achieved by JRL. However, for the next four weeks the achievable production level will be reduced due to a shortage of available resources. The resources that are expected to be available are as follows:

Direct material A	900 kg
Direct material B	1,750 kg
Skilled labour	1,250 hours
Machine time	2,400 machine hours

*Required:*

- (a) **Identify**, using graphical linear programming, the weekly production schedule for products J and L that will maximise the profits of JRL during the next four weeks.

*(15 marks)*

- (b) The optimal solution to part (a) shows that the shadow prices of skilled labour and direct material A are as follows:

Skilled labour	\$ Nil
Direct material A	\$11.70

**Explain** the relevance of these values to the management of JRL.

*(6 marks)*

- (c) **Explain**, using the graph you have drawn in part (a), how you would calculate by how much the selling price of Product J could increase before the optimal solution would change.

*(4 marks)*

*(Total for Question Six = 25 marks)*

*Section B continues on page 8*

TURN OVER

## Question Seven

HTL owns three hotels in different regions of the same country. The company uses the same accounting policies and cost of capital of 10% per annum for all the hotels that it owns. All rooms are sold on a “bed and breakfast” basis. The hotels are open for 365 days per year. The restaurants provide breakfasts to hotel guests only. At all other times the restaurants are available to hotel guests and the general public. Details for each hotel for the year ended 31 December 2011 are as follows:

<i>Hotel</i>	<i>Northern</i>	<i>Southern</i>	<i>Eastern</i>
Number of bedrooms available	120	250	135
% bedroom occupancy	80%	75%	60%
Regional Bedroom Market share %	15%	16%	5%
Restaurant capacity per day (meals)	100	120	85
Restaurant utilisation	60%	40%	60%
	<i>\$000</i>	<i>\$000</i>	<i>\$000</i>
Revenue:			
Bedroom with breakfast	3,328	8,500	2,365
Restaurant	<u>876</u>	<u>776</u>	<u>837</u>
Total	<u>4,204</u>	<u>9,276</u>	<u>3,202</u>
Profit before tax	832	1,100	576
Net Assets at 31 December	4,200	7,400	4,400

An analysis of the costs incurred by each of the hotels for the year ended 31 December 2011 is as follows:

<i>Hotel</i>	<i>Northern</i>	<i>Southern</i>	<i>Eastern</i>
	<i>\$000</i>	<i>\$000</i>	<i>\$000</i>
Bed and breakfast related	2,847	7,231	2,082
Restaurant related	<u>525</u>	<u>945</u>	<u>544</u>
Total	<u>3,372</u>	<u>8,176</u>	<u>2,626</u>

It has also been noted that the restaurant related costs, capacity and utilisation information does not include breakfasts.

Some of the following performance indicators have already been calculated:

<i>Hotel</i>	<i>Northern</i>	<i>Southern</i>	<i>Eastern</i>
Return on Net Assets	20%	15%	???
Residual Income (\$000)	412	???	136



*Required:*

(a) **Discuss** the relative performance of the three hotels.

**Note:**

Your answer should include:

- a review of the relative profits of the rooms and restaurants in each hotel; and
- calculations of the Return on Net Assets, Residual Income and other performance measures that you think are appropriate.

*(18 marks)*

(b) The Northern Hotel manager has investment decision authority. The manager is considering investing \$800,000 in the construction of a leisure facility at the hotel. The hotel has permission to build the leisure facility, but will have to accept the terms of an agreement with the local community before beginning its construction. The facility is expected to generate additional annual profit for the hotel over the next five years as follows:

	\$000
2012	110
2013	120
2014	155
2015	145
2016	130

At the end of 2016 the facility will have to be sold to the local community for \$550,000. If the facility is built, it will be depreciated on a straight line basis over the 5 year period (i.e. \$50,000 per annum).

The investment has a positive net present value of \$225,000 when discounted at the group's cost of capital.

The manager of the hotel receives an annual bonus if the hotel's Return on Net Assets is maintained or improved. As stated in part (a) this was 20% for 2011 based on net assets at the end of the year.

*Required:*

**Discuss** the effect of this investment on the future performance of the Northern Hotel and whether, in the light of this, the hotel manager is likely to proceed with the investment.

*(7 marks)*

*(Total for Question Seven = 25 marks)*

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*(Total for Section B = 50 marks)*

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*End of question paper*

*Maths tables and formulae are on pages 11 to 14*

## PRESENT VALUE TABLE

Present value of 1 unit of currency, that is  $(1+r)^{-n}$  where  $r$  = interest rate;  $n$  = number of periods until payment or receipt.

Periods ( $n$ )	Interest rates ( $r$ )									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

Periods ( $n$ )	Interest rates ( $r$ )									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

Cumulative present value of 1 unit of currency per annum, Receivable or Payable at the end of each year for  $n$  years  $\frac{1-(1+r)^{-n}}{r}$

Periods ( $n$ )	Interest rates ( $r$ )									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514

Periods ( $n$ )	Interest rates ( $r$ )									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870

## FORMULAE

### PROBABILITY

$A \cup B = \mathbf{A \text{ or } B}$ .       $A \cap B = \mathbf{A \text{ and } B}$  (overlap).  
 $P(B | A)$  = probability of  $B$ , given  $A$ .

#### Rules of Addition

If  $A$  and  $B$  are mutually exclusive:       $P(A \cup B) = P(A) + P(B)$   
If  $A$  and  $B$  are not mutually exclusive:       $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

#### Rules of Multiplication

If  $A$  and  $B$  are *independent*:       $P(A \cap B) = P(A) * P(B)$   
If  $A$  and  $B$  are **not independent**:       $P(A \cap B) = P(A) * P(B | A)$

$E(X) = \sum (\text{probability} * \text{payoff})$

### DESCRIPTIVE STATISTICS

Arithmetic Mean

$$\bar{x} = \frac{\sum x}{n} \quad \bar{x} = \frac{\sum fx}{\sum f} \quad (\text{frequency distribution})$$

Standard Deviation

$$SD = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad SD = \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}^2} \quad (\text{frequency distribution})$$

### INDEX NUMBERS

Price relative =  $100 * P_1/P_0$       Quantity relative =  $100 * Q_1/Q_0$

Price: 
$$\frac{\sum w * \left(\frac{P_1}{P_0}\right)}{\sum w} * 100$$

Quantity: 
$$\frac{\sum w * \left(\frac{Q_1}{Q_0}\right)}{\sum w} * 100$$

### TIME SERIES

Additive Model

Series = Trend + Seasonal + Random

Multiplicative Model

Series = Trend \* Seasonal \* Random

## FINANCIAL MATHEMATICS

### Compound Interest (Values and Sums)

Future Value  $S$ , of a sum of  $X$ , invested for  $n$  periods, compounded at  $r\%$  interest

$$S = X[1 + r]^n$$

### Annuity

Present value of an annuity of £1 per annum receivable or payable for  $n$  years, commencing in one year, discounted at  $r\%$  per annum:

$$PV = \frac{1}{r} \left[ 1 - \frac{1}{[1 + r]^n} \right]$$

### Perpetuity

Present value of £1 per annum, payable or receivable in perpetuity, commencing in one year, discounted at  $r\%$  per annum:

$$PV = \frac{1}{r}$$

## LEARNING CURVE

$$Y_x = aX^b$$

where:

$Y_x$  = the cumulative average time per unit to produce  $X$  units;

$a$  = the time required to produce the first unit of output;

$X$  = the cumulative number of units;

$b$  = the index of learning.

The exponent  $b$  is defined as the log of the learning curve improvement rate divided by log 2.

## INVENTORY MANAGEMENT

Economic Order Quantity

$$EOQ = \sqrt{\frac{2C_o D}{C_h}}$$

where:  $C_o$  = cost of placing an order  
 $C_h$  = cost of holding one unit in inventory for one year  
 $D$  = annual demand

## LIST OF VERBS USED IN THE QUESTION REQUIREMENTS

A list of the learning objectives and verbs that appear in the syllabus and in the question requirements for each question in this paper.

It is important that you answer the question according to the definition of the verb.

LEARNING OBJECTIVE	VERBS USED	DEFINITION
<b>Level 1 - KNOWLEDGE</b> What you are expected to know.	List State Define	Make a list of Express, fully or clearly, the details/facts of Give the exact meaning of
<b>Level 2 - COMPREHENSION</b> What you are expected to understand.	Describe Distinguish Explain  Identify  Illustrate	Communicate the key features Highlight the differences between Make clear or intelligible/State the meaning or purpose of Recognise, establish or select after consideration Use an example to describe or explain something
<b>Level 3 - APPLICATION</b> How you are expected to apply your knowledge.	Apply Calculate Demonstrate  Prepare Reconcile Solve Tabulate	Put to practical use Ascertain or reckon mathematically Prove with certainty or to exhibit by practical means Make or get ready for use Make or prove consistent/compatible Find an answer to Arrange in a table
<b>Level 4 - ANALYSIS</b> How are you expected to analyse the detail of what you have learned.	Analyse Categorise Compare and contrast  Construct Discuss Interpret Prioritise Produce	Examine in detail the structure of Place into a defined class or division Show the similarities and/or differences between Build up or compile Examine in detail by argument Translate into intelligible or familiar terms Place in order of priority or sequence for action Create or bring into existence
<b>Level 5 - EVALUATION</b> How are you expected to use your learning to evaluate, make decisions or recommendations.	Advise Evaluate Recommend	Counsel, inform or notify Appraise or assess the value of Advise on a course of action

*Performance Pillar*

*Management Level Paper*

*P2 – Performance Management*

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