



PERFORMANCE MANAGEMENT

PROFESSIONAL LEVEL EXAMINATION

APRIL 2021

NOTES:

You are required to answer **ALL** Questions.

PRESENT VALUE TABLES ARE PROVIDED

TIME ALLOWED:

3.5 hours, plus 10 minutes to read the paper. This is a closed book examination.

INSTRUCTIONS:

During the reading time, candidates are encouraged to use this time to read each Question carefully. Please note, however, candidates will not be prevented from using this time to start typing notes and solutions.

Marks for each question are shown. The pass mark required is 50% in total over the whole paper.

You are reminded to pay particular attention to your communication skills, and care must be taken regarding the format and literacy of your solutions. The marking system will take into account the content of your answers and the extent to which answers are supported with relevant legislation, case law or examples, where appropriate.

N.B. Please note that the right click function has been disabled during your examination. Should you wish to copy and paste, please use the following shortcuts: Copy (Ctrl + C) and Paste (Ctrl + V).

Question 1

Zambezi Ltd manufactures three different models of e-reader. The following budget data relates to the fourth quarter of last year:

Product:	Model A	Model B	Model C
Selling price per unit	€60	€80	€100
Variable cost per unit	€25	€40	€55
Sales quantities (units)	2,000	1,200	800

After this budget was finalised, the company's CEO decided that the company should take greater advantage of a surge in demand for electronic products arising from the fact that so many consumers are largely housebound due to Covid-19 restrictions. Specifically, he directed that the unit selling prices of all three models should be increased by 5% above the levels specified in the budget. He also directed that the design specifications for all three models should be changed to use cheaper raw materials; this reduced the variable cost per unit by €2 for each model and slightly reduced the quality of the finished products.

At the end of the quarter, the CEO was pleased to see that the actual sales quantities achieved during the quarter were higher than budget, as the following data shows:

Product:	Model A	Model B	Model C
Actual sales quantities (units)	2,400 units	1,250 units	850 units

No inventories of any kind were held at beginning or end of the quarter.

REQUIREMENT:

- (a) Determine Zambezi Ltd's total budgeted and actual contribution for the quarter. Present a detailed variance analysis to reconcile the budgeted and actual contributions in as much detail as is possible from the information provided above. Your answer should include sales mix and sales quantity variances.

(16 Marks)

- (b) Assume now that, at your request, the company's marketing manager has provided the following additional information. When the original budget for the quarter was being prepared, the marketing manager's estimate was that the total size of the market for this type of e-reader, including all three models sold by Zambezi Ltd and all sales of similar products by its competitors, would amount to 16,000 units. However, the marketing manager believes that, largely because of extra consumer demand arising from Covid-19 restrictions, the actual market size was 20,000 units.

Use this additional information to determine market share and market size variances for Zambezi Ltd. A breakdown by product is not required.

(7 Marks)

- (c)** Evaluate Zambezi Ltd's performance in the quarter, using your answers to parts (a) and (b) to illustrate your answer. Your answer to this part should include critical analysis of the decisions to change selling prices and design specifications.

(7 Marks)

(TOTAL: 30 Marks)

Question 2

Nile Plc is a divisionalised company. The bonus paid to each division manager in any financial year is linked to the amount by which the division's Return on Investment (ROI) exceeds the cost of capital. Under the company's performance measurement rules, ROI is calculated as net profit divided by the net book value of the division's net assets at the beginning of the financial year. It can be assumed that the cost of capital in all divisions is 5% per annum.

Barbara Walsh is division manager of the Atbara Division, which has been one of the company's most successful divisions for the last several years. Barbara believes that the Atbara Division will earn a ROI of approximately 9.5% per annum next year (2022) and in each subsequent year. This is before taking account of a possible new capital investment project ("NCIP") which Barbara has recently identified. This would involve an investment of €37,500 on 1 January 2022 followed by a sequence of net cash inflows over a three-year period as shown in this table:

	31 December 2022	31 December 2023	31 December 2024
Net cash inflow:	€15,000	€13,800	€19,000

Barbara has the authority to decide whether her division should invest in NCIP. In accordance with Nile Plc's normal performance measurement rules, the cost of the investment in NCIP would be depreciated on a straight-line basis over a 3-year useful life with no residual value.

Barbara regards herself as a diligent manager who is keen to maximise shareholder value. However, she also believes that she is entitled to maximise her own bonuses (having regard to the performance management system used by her employer) and to have regard to her own career prospects. Barbara has already decided to leave Nile Plc at the end of 2023 and to start work as an independent consultant.

REQUIREMENT:

- (a) Would Barbara accept the proposal to invest in NCIP if she were concerned solely in maximising shareholder value? Justify your answer fully (your answer should include, but not be limited to, appropriate net present value calculations).

Determine the ROI of NCIP for each of the three years of its life and explain (with detailed justification) whether the performance measurement rules in use in Nile Plc at present are likely to motivate Barbara to behave in a goal congruent manner when deciding whether or not to invest in NCIP.

(12 marks)

- (b) Would the use of Residual Income (instead of ROI) as the measure of divisional performance in Nile Plc lead to more goal-congruent decision-making by division managers in the company in relation to capital investment decisions? Justify your answer. Your answer should include (but not be limited to) calculation of the Residual Income of NCIP in each of the three years of its life.

(7 marks)

- (c) The CEO of Nile Plc has identified a small number of business units (not including Atbara Division) which should be treated as “profit centres” rather than “investment centres” for performance evaluation purposes. His argument for this proposed change is that, although the managers of these business units have significant powers to make decisions about the volumes of production and sales, they do not have powers to request funding from the company to purchase additional capital assets such as equipment or buildings.

Evaluate this proposed change.

(6 marks)

(TOTAL: 25 Marks)

Question 3

Tana Ltd (Tana) manufactures several products in its factory outside Dublin. The company's research and development (R & D) staff are at present carrying out the advanced stages of design work for a proposed new product (code-named "PX").

Managers and staff from various functions within Tana have now been invited to contribute their expertise in relation to PX. The marketing manager of Tana estimates that, having regard to prices charged by competitors for similar products, Tana can achieve a selling price of €145 per unit for PX. The company's financial manager indicates that Tana would require a profit margin of 40% of this selling price in order to justify the capital investment in the new production and distribution facilities which Tana would require if it were to add PX to its product range.

A cross-functional team of managers and staff is now carrying out a target costing exercise in order to evaluate the product design and its cost implications. The following information is available:

- Production of each unit of PX would require 12 units of a component which would be bought from an established outside supplier at a price of €3 each. Unfortunately, this component is very delicate, and it is estimated that 25% of components purchased would be wasted.
- Three quarters of an hour of direct labour would be required for the production of each unit of PX. The cost of this labour would be €18 per direct labour hour (DLH).
- Tana's existing product costing system allocates manufacturing overheads (OH) to products on a DLH basis. Fixed and variable OH are charged at separate rates. The fixed OH rate is determined on the basis of the average monthly level of production activity in the factory, which is 10,000 DLH per month. The following data is provided for two recent months to enable you to estimate the monthly fixed OH and the variable OH per DLH:

	Total OH for the month	Total DLH for the month
December 2020:	€438,000	8,000
January 2021:	€600,000	12,500

REQUIREMENT:

- (a) Estimate the target cost (per unit) of the PX. Estimate the cost (per unit) of the PX based on the proposed design and the company's existing product costing system. Clearly identify any gap between these two figures for the cost (per unit) of the PX.

(12 marks)

- (b) A member of the R & D staff has identified a design change which would reduce by 15 minutes the amount of direct labour time needed in order to manufacture one unit of PX. Estimate the effect on the estimated cost (per unit) of the PX, assuming that the existing product costing system continues to be used.

(4 marks)

- (c) The company's management accountant has told you: *"DLH are not the cost driver for any of the OH costs. Therefore, I think that your answer to part (b) does not accurately show the cost reduction which can be achieved by the 15 minutes reduction in the DLH content of each unit of PX"*.

Do you agree with the accountant's statement? Justify your answer in detail.

(4 marks)

(TOTAL: 20 Marks)

Question 4

Sanaga Ltd (Sanaga) operates a website which provides educational content which is selected and designed for use by secondary school learners in Ireland. This educational content includes videos, podcasts, and text documents. Sanaga promotes the fact that this content is specially developed by educational publishers and is not available elsewhere. Customers pay a fixed monthly family subscription fee for which they receive unlimited access to the site.

The website first went live in January 2020. It was not designed specifically with home schooling in mind, but the company's CEO has stated that the prolonged school closures in 2020 and 2021 as a result of Covid-19 made for a very receptive market. Consequently, Sanaga has found it easy to recruit subscribers, who are mostly parents of secondary school learners. Recently, Sanaga conducted research among its subscribers so as to try to understand their motivation for subscribing to Sanaga's website instead of relying on educational resources which are available for free. This research determined that a key factor in this motivation is that Sanaga's website provides a particularly efficient way of obtaining access to resources which are highly relevant to the needs of secondary school learners in Ireland. One customer commented *"on Sanaga's website I can quickly and easily find a video or other resource which is very relevant to whatever [my son or daughter] is working on... I don't have to waste a lot of time and energy browsing and being distracted by ads, which is what tends to happen when I go trawling through free sites like YouTube"*.

When schools are closed due to Covid-19, Sanaga experiences increased demand for its website from both existing and new subscribers. However, the CEO has decided not to increase prices at times of Covid-19 school closures, for two reasons. First, she believes that price increases at such times would be seen as cynical and exploitative. Second, she does not see Sanaga primarily as an "emergency provider" but is instead keen to build up a loyal base of regular customers who will continue to subscribe to the website as a key educational resource even when schools are functioning normally. Sanaga offers a 75% discount from its regular subscription price during the normal school summer holidays (June, July, and August). The strategic purpose of these discounts is to encourage existing customers to keep renewing their subscriptions (and to encourage new customers to "try before they buy at the regular subscription price") and to motivate customers (existing and new) to explore the resources of the website when they have some free time during the summer.

The CEO has designed a performance management system involving the use of a set of four monthly performance metrics to enable her to assess the success of the business and to obtain "advance indication" of any future problems and opportunities. The following are the metrics which are measured on a monthly basis in this performance management system:

- Number of subscribers;
- Average number of hours (per subscriber) spent actively using the site (i.e., spent watching videos, listening to podcasts, and/or downloading text documents);
- Total content available on the site (i.e., total available hours of video/podcasts and total number of text documents, measured separately);
- Net profit.

REQUIREMENT:

Evaluate the suitability of the above performance metrics for the purposes outlined by the CEO.

(TOTAL: 15 Marks)

Question 5

Didessa Ltd manufactures and distributes a wide range of products. In recent years, the company has used simple analytical models to forecast its monthly manufacturing overhead costs (MMOC), but the production manager has found that actual costs differed significantly from these forecasts.

In an attempt to improve the accuracy of forecasting, the production manager has now decided to develop a regression model to help forecast MMOC. This model will be constructed using a data set consisting of monthly manufacturing overhead cost data from the last 6 years (hence, 6 years * 12 months = 72 data observations). A recent activity-based costing analysis has revealed that there are 12 cost drivers for manufacturing overhead costs in Didessa Ltd. In an effort to predict MMOC the production manager has initially decided to use all 12 cost drivers as independent variables in the regression model, with MMOC as the dependent variable.

REQUIREMENT:

- (a) Discuss TWO significant and distinct limitations of the proposed regression model as a basis for forecasting MMOC and (and for each of these two limitations) suggest changes to the model which would be likely to improve its accuracy in this regard.

(6 marks)

- (b) Explain what is meant the term “Internet of Things” (IOT). Then, as a consumer, explain one example of how you would be worried or concerned about its impact on you.

(4 marks)

(TOTAL: 10 Marks)

END OF PAPER

SUGGESTED SOLUTIONS

THE INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS IN IRELAND

PERFORMANCE MANAGEMENT

PROFESSIONAL LEVEL - APRIL 2021

SOLUTION 1 - Zambezi Ltd.

(a)

Budget contribution:

	A	B	C	Total
Per unit	$60 - 25 = €35$	$80 - 40 = €40$	$100 - 55 = €45$	
Total	$2,000 * €35 = €70,000$	$1,200 * €40 = €48,000$	$800 * €45 = €36,000$	€154,000

Actual contribution:

	A	B	C	Total
Budgeted contribution per unit	€35	€40	€45	
Price increase	$5% * €60 = €3$	$5% * €80 = €4$	$5% * €100 = €5$	
Variable cost reduction	€2	€2	€2	
Actual contribution per unit	€40	€46	€52	
Total	$2,400 * €40 = €96,000$	$1,250 * €46 = €57,500$	$850 * €52 = €44,200$	€197,700

Variances:

Variable cost variance

Product	Reduction in VC per unit	Actual Quantity (AQ)	Variance
A	€2	2,400	€4,800 F
B	€2	1,250	€2,500 F
C	€2	850	€1,700 F
Total			€9,000 F

Sales price variance

Product	(AP – SP)	Actual Quantity (AQ)	Variance
A	€3	2,400	€7,200 F
B	€4	1,250	€5,000 F
C	€5	850	€4,250 F
Total			€16,450 F

Workings for sales mix and quantity variances:

- Total sales units:

Budget
 $2,000 + 1,200 + 800 = 4,000$

Actual
 $2,400 + 1,250 + 850 = 4,500$

- Budgeted sales mix:
 - A: $2,000 / 4,000 = 0.5$.
 - B: $1,200 / 4,000 = 0.3$.
 - C: $800 / 1,200 = 0.2$.
- Budgeted weighted average contribution per unit
 $= (0.5 * €35) + (0.3 * €40) + (0.2 * €45) = €38.50$.

Sales mix variance:

	AQ, in actual mix	AQ in standard mix [5:3:2]	Standard contribution per unit	Variance
A	2,400	2,250	€35	€5,250 F
B	1,250	1,350	€40	€4,000 U
C	850	900	€45	€2,250 U
Total	4,500	4,500		€1,000 U

Sales quantity variance:

Actual Quantity (AQ)	Budgeted Quantity (BQ)	Budgeted weighted average contribution	Variance
4,500	4,000	€38.50	$500 * €38.50 = €19,250$ F

Or: Sales quantity variance:

	AQ, in standard mix	BQ, in standard mix	Standard contribution per unit	Variance
A	2,250	2,000	€35	€8,750 F
B	1,350	1,200	€40	€6,000 F
C	900	800	€45	€4,500 F
Total	4,500	4,000		€19,250 F

Reconciliation

Budget contribution	€154,000
Variable cost variance	€9,000 F
Selling price variance	€16,450 F
Sales mix variance	€1,000 U
Sales quantity variance	€19,250 F
Actual contribution	€197,700

Part (b):

Market size variance:

- Actual market size = 20,000.
- Budget market size = 16,000.
- Budget market share percentage = $4 / 16 = 25\%$.
- Variance = $(20,000 - 16,000 = 4,000) * 25\% * €38.50 = €38,500 \text{ F}$.

Market share variance:

- Actual quantity = 4,500.
- Standard share of actual market = $25\% * 20,000 = 5,000$.
- Variance = $(4,500 - 5,000 = 500) * €38.50 = €19,250 \text{ U}$.

Part (c):

At first glance Zambezi Ltd. appears to have had a very successful quarter:

- Actual contribution (€197,700) is considerably more than budgeted (€154,000), an increase of €43,700.
- In the case of each of the three products, sales (in units) have increased despite the decision to increase the per-unit selling prices by 5% and the decision to allow the quality of the products to decline in order to achieve variable cost reductions. The combined effect of all of these changes has been a SPV of €16,450, a SQV of €19,250, and a materials cost variance of €9,000. This is a combined total of €44,700, i.e., slightly more than 100% of the overall improvement in total contribution.

But further reflection gives important additional insight:

- Zambezi Ltd. can take no credit at all for the favourable SQV. On the contrary, it is made up of a favourable market size variance of €38,500 F (due to factors beyond the company's control, such as the Covid-19 influences) and an unfavourable market share variance of €19,250 (arising from a loss of market share to competitors, due to controllable factors such the selling price increases and the reductions in variable cost and product quality).
- Arguably however the changes have been worthwhile because the unfavourable market share variance (€19,250) is less than the combined effects of the factors which seem to have caused it (SPV €16,450 F + variable costs variances €9,000 F = €25,450 F). However there may be a recurring loss of market share (due to reputational damage due to poorer product quality and/or uncompetitive selling prices) and if so there may be future losses arising from the changes made in this period.
- There was also a small unfavourable sales mix variance of €1,000 arising from a shift in demand towards the lowest-contribution product (Model A). This is also an unwelcome development since even those sales which are being achieved increasingly tend to be of the lowest-contribution product.

Purpose of the question; essential elements of the answer and acceptable variations:

- The purpose of the question is to require candidates to conduct an advanced variance analysis and to use the results to evaluate a company's performance.
- It is essential that candidates carry out the variance analysis in the level of detail specified in the question and that they provide a rigorous analysis of performance making full use of the results of the calculations.
- The precise points made in answer to part [c] may vary from those made here, but a thorough and well-supported analysis is required.

SOLUTION 2 - Nile PLC

Part (a)

NPV @ 5%

$$= -€37,500 + (€15,000 * 0.952) + (€13,800 * 0.907) + (€19,000 * 0.864)$$

$$= -€37,500 + €14,280 + €12,517 + €16,416$$

$$= +€5,713$$

Points to be made about shareholder value:

- If Barbara is concerned to maximise shareholder value then it is likely that she would accept the proposal.
- This assumes that NPV accurately captures the additional wealth generated for the shareholders, e.g., in a perfect capital market acceptance of the investment would increase the company's market capitalisation by this amount.
- More generally, the positive NPV indicates that the returns to the shareholders exceed the cost of capital, indicating that (in net terms) it would generate shareholder wealth.

ROI calculation:

	2022	2023	2024
Cash inflows	€15,000	€13,800	€19,000
Depreciation = €37,500 / 3 years =	€12,500	€12,500	€12,500
Profit	€2,500	€1,300	€6,500
Book value of assets at 1st January	€37,500	€25,000	€12,500
ROI	6.7%	5.2%	52%

Motivational effect of the performance measurement system on Barbara:

- She will not be motivated to accept NCIP because the ROI in the next two years is far less than the 9.5% which she is likely to achieve without NCIP.
- The very high ROI in 2024 will have no motivational effect because she plans to leave the company before then.
- This is not goal congruent because (as shown above) shareholders favour acceptance of the investment.

Part (b)

	2022	2023	2024
Profit (same as ROI calculation)	€2,500	€1,300	€6,500
Finance charge	5% * €37,500 = €1,875	5% * €25,000 = €1,250	5% * €12,500 = €625
Residual income	€625	€50	€5,875

Motivational effect:

- The Residual Income of the Atbara Division (and therefore Barbara's bonus) would be increased by acceptance of the investment. Barbara would therefore be motivated to accept the investment by the positive Residual Income in 2022 and 2023. Such acceptance is goal congruent, as shown by the positive NPV in part [a].
- The Residual Income in 2024 would have no effect on Barbara's decision since she plans to leave the company before then and therefore would not benefit from this 2024 Residual Income.
- There is no guarantee that the introduction of Residual Income as a performance measure would improve goal congruence in general in Nile PLC. It could happen that another capital investment (either in Atbara Division or another division) would have a positive NPV (and thus be favoured by the shareholders) nevertheless had an adverse effect on Residual Income in the first year of its life and might be rejected on those grounds by a division manager with a preference for short-term bonuses.

Part (c)

- In assessing a manager's performance, organisations typically apply the controllability principle, i.e., they seek to use a performance measure which captures the effect of only those factors which a manager can control. If a business unit (BU) manager cannot control the level of capital investment in his/her BU then it seems appropriate to use a profit centre rather than an investment centre approach. For example, if it were the case that the vast majority of the capital required for new investments in the BUs referred to by the CEO was in capital assets such as equipment and buildings, then it could be argued that that investment is largely "uncontrollable" in such cases.
- However even if a BU manager cannot request funding for investment in capital assets such as equipment or buildings, nevertheless s/he may have significant powers to invest the company's capital. For example, an expansion of the scale of production and sales so as to capitalise on an opportunity in a new market may mean significant new investment in inventories (of raw material and finished product) and trade debtors. So the BU manager can make a significant investment in working capital and the performance measure used needs to reflect the cost of that investment.

Purpose of the question; essential elements of the answer and acceptable variations:

- The purpose of the question is to require candidates to implement a system of divisional performance evaluation using ROI, and to consider the goal congruence effects of the existing system and of possible changes such as a change to Residual Income and/or the designation of some business units as profit centres rather than investment centres.
- Calculations of NPV, ROI, and Residual Income as specified in the question are essential. It is also essential that candidates provide comprehensive qualitative answers where necessary, e.g., in relation to the likely motivational impact of the performance measures in this case and the appropriateness (or otherwise) of the changes proposed in parts [b] and [c] of the question.
- The precise qualitative points made in answer to the various parts of the question may vary from those made here, but the fundamental issues must be identified and addressed.

SOLUTION 3 - Tana Ltd.

Part (a)

Target cost

$$= \text{€}145 \text{ selling price} - (40\% * \text{€}145 = \text{€}58 \text{ margin}) = \text{€}87$$

Estimate of cost, based on the proposed design and the company's existing product costing system:

- Components: $[12 \text{ units} * (100\% - 25\%) = 16 \text{ units}] * \text{€}3 = \text{€}48$ for each PX
- Direct labour: $0.75 \text{ DLH hours} * \text{€}18 = \text{€}13.50$ for each PX
- Overheads:

	Total OH	Total DLH
December	€438,000	8,000 DLH
January	€600,000	12,500 DLH
Difference:	€162,000	4,500 DLH

➔ Variable OH = $\text{€}162,000 / 4,500 \text{ DLH} = \text{€}36$ per DLH

⇒ Fixed OH = $\text{€}438,000 - (8,000 \text{ DLH} * \text{€}36 = \text{€}288,000) = \text{€}150,000$ per month

⇒ OR Fixed OH = $\text{€}600,000 - (12,500 \text{ DLH} * \text{€}36 = \text{€}450,000) = \text{€}150\text{K}$ per month

⇒ Fixed OH absorption rate = $\text{€}150,000 / 10,000 \text{ "typical" DLH per month} = \text{€}15$ per DLH

For each PX:

Variable OH: $0.75 \text{ DLH} * \text{€}36 \text{ per DLH} = \text{€}27$

Fixed OH: $0.75 \text{ DLH} * \text{€}15 \text{ per DLH} = \text{€}11.25$

- Estimate of cost of PX based on current design
= $\text{€}48 \text{ components} + \text{€}13.50 \text{ direct labour} + \text{€}27 \text{ VO} + \text{€}11.25 \text{ FO}$
= $\text{€}99.75$

Target cost gap

$$= \text{€}99.75 - \text{€}87 = \text{€}12.75$$

Part (b)

- Reduction in labour cost = $0.25 \text{ DLH} * \text{€}18 = \text{€}4.50$
- Reduction in OH allocated to each unit of PX:
= $0.25 \text{ DLH} * (\text{€}36 \text{ VO per DLH} + \text{€}15 \text{ FO per DLH}) = \text{€}12.75$
- Hence: Under the existing product costing system, the cost of manufacturing one unit of the PX is reduced by $(\text{€}4.50 + \text{€}12.75 = \text{€}17.25)$.

Part (c)

- The management accountant is correct in her statement that the benefit of reducing the DLH content of the product by 15 minutes is overstated by the calculation in part [b].
- The only “real” reduction in the unit cost of PX is €4.50 (the direct labour element).
- DLH are not the cost driver for any OH cost. Therefore reducing the DLH content of PX will not bring about a reduction in Tana Ltd.’s OH costs. There will be a reduction of €12.75 in the amount of OH allocated to each unit of PX but there will be no reduction in the total amount of OH paid by the company. These OH which are no longer allocated to PX will either be allocated to the company’s other products or will become underabsorbed OH. As an alternative, an activity-based costing system would provide a much more realistic indication of the genuine reductions in the overhead cost of producing the product which would result from any proposed changes to the product design.

Purpose of the question; essential elements of the answer and acceptable variations:

- The purpose of the question is to require candidates to implement a target costing system, and to demonstrate and analyse the actual and apparent impact on the target cost gap of a proposed change to product design.
- It is essential to carry out the calculations as specified in parts [a] and [b]. In part [c] it is essential to identify and explain the way in which the product costing system generates an apparent saving in product cost but does not actually reduce the company’s total costs; instead costs are simply diverted away from this product but will eventually be allocated to other products (or will end up as underabsorbed overheads).
- There is limited scope for variation in parts (a) and (b). However the reasoning in part [c] may be developed in a different way from that suggested here (although the substance of the underlying issue must be made clear)

SOLUTION 4 - Sanaga Ltd.

- **Number of subscribers:** The company sells its content on a subscription basis only, so there are no “casual” or “once-off” sales. This is a good strategy for this business, but it does mean that the number of subscribers is of fundamental importance to the success of the business. Every subscriber is a potential repeat customer, and there is a significant potential market which the company is (rightly) keen to maintain and build even when schools are functioning normally. It would be appropriate to measure not just total subscriber numbers but also (separately) the numbers of new and repeat subscribers – for example, if the total number of subscribers remains approximately constant from month to month, nevertheless it would be important to know if this was due to a high rate of non-renewals being “masked” by new subscriptions, because this would mean that the company was failing to build a long-term customer base for the website.

Sanaga should have different targets for subscriber numbers for (1) term-time when schools are closed due to Covid-19 (since this is a time of particular interest from existing and potential new subscribers); (2) Summer (when the objective of having subscribers is mainly to build market share rather than to earn significant current revenue; and (3) term-time when schools are open as normal Autumn (since the company regards this as the ability to build and maintain its subscriber base at such times as fundamental to the success of its business model).

- **Average number of hours spent actively using the site:** It is tempting to say that this doesn’t matter since customers pay a fixed fee even if they make little use of the service. But this would be a mistaken view: If the number of hours spent watching is declining then the probability of the customer continuing to subscribe is reduced.

One difficulty in implementing this metric lies in the different types of content. For example, someone might spend just a few minutes downloading a text document (e.g., a maths problem sheet) and then spend a full hour working on it. The customer is likely to regard this as a getting “1 hour of active usage from my subscription.” However the metric captures the download time only (i.e., just a few minutes) and thus underestimates the amount of active usage.

- **Total amount of content available on the site:** For Sanaga, having a very large amount of content on the website would be something of a “double-edged sword”. On the one hand, additional content gives users a reason to continue subscribing; customers would quickly lose interest (and cancel their subscriptions) if they got tired of seeing “the same old material”.

However Sanaga’s research has indicated that a key factor motivating customers to subscribe to the site is the fact that they can easily locate content highly relevant to them. Simply expanding the total volume of content could undermine this and leave subscribers feeling that they might as well rely on free services such as YouTube. Therefore, any increase in content on Sanaga’s site needs to be accompanied by excellent indexing (e.g., as to the relevance of material for specific school subjects and years) so that customers will find it to be beneficial rather than a source of confusion.

- **Monthly net profit:** Net profit is very important as an outcome measure, but it is very difficult to interpret and use monthly net profit as a metric in a performance measurement system for the purposes outlined by the CEO. Take, for example, the 75% discount from regular subscription prices during the summer months. This may well make those months “loss leaders”, but for the particular strategic purpose of building up bigger market share. It is hard to interpret short-term monthly profit numbers when the company is (rightly) prioritising other goals such as market share growth. At the very least it is important to have different profit goals reflecting the significant seasonal differences in both price levels and demand.

Another problem with profit as a performance measure is that it is an outcome measure which captures the impact of a great many factors. Thus it is comprehensive but it is also very difficult to interpret in terms of likely causes and likely future problems and opportunities. For example if profit in February 2021 is much higher than in February 2020 then what is the information content of the change? Does it (for example) reflect enormous differences in subscriber numbers or a significant change in expenditures on the development of new content?

These are obviously very important questions and they are far better answered by scrutinising specific measures (such as number of subscribers and expenditure on development of materials) rather than by a “catchall” profit number.

Purpose of the question; essential elements of the answer and acceptable variations:

- The purpose of the question is to require candidates to evaluate a performance management system involving a combination of four nonfinancial and financial metrics, against the background of the particular business model and competitive strategy of the firm as explained in the question.
- It is essential that candidates critically evaluate the suitability four metrics for the purposes for which they are used in this company given its specific background.
- There is scope for variation in the specific points made, but a rigorous and thorough analysis (which has regard to the specific circumstances of the company as outlined in the question) is required.

SOLUTION 5 - Didessa Ltd.

Part (a):

Examples of two possible issues: (Any two of the following; valid alternatives also accepted).

Note: The level of detail presented here in relation to part (a) is greater than expected under examination conditions:

- Data set: The fact that some of the data is very old (up to 6 years) could undermine the forecasting accuracy of the model, even though it is in the nature of regression analysis that it uses past data to try to predict the future. In this case, older data may well be unrepresentative of present cost conditions because of factors such as cost inflation and changes in cost driver relationships (e.g., a task which was carried out manually six years ago may be automated today). One solution to this problem is to reduce the size of the data set to eliminate “out-of-date” data (e.g., data more than 2 years old). Similarly, it should also be considered whether any of the months represented unusually “good” or “bad” conditions, in which case that month’s data could skew the model, and therefore could be removed in order to improve its forecasting accuracy. Changes of these types could reduce the size of the data set but increase its quality, and thereby increase the potential forecasting accuracy of the data. Another solution could be to adjust the cost data for inflation. Of course, it could alternatively be argued that a sample size of 72 is too small and that the size of the data set should be increased by using weekly (rather than monthly) cost data but this would bring its own difficulties because many costs (e.g., rent) are not accrued on a monthly basis in most company’s accounts.
- Twelve independent variables in a multiple regression model is perhaps too many. For example, the data may exhibit a collinear pattern, with (for example) a pair of independent variables such as MH and DLH having had a past tendency to “increase simultaneously” and “decrease simultaneously”, so that the model is unable to reliably identify the separate effect of each of these variables on overhead costs. The cost forecasts would become particularly unreliable in any future period which deviated from the collinear pattern experienced in the past, e.g., a future period with MH increasing but DLH staying constant. The model’s forecasting accuracy can be improved by reducing the number of independent variables (specifically, if two independent variables have exhibited a collinear pattern in the data then one of them should be dropped from the model).
- Cost driver relationships, as identified in an ABC study, typically reflect a long-term relationship between the causal factor (cost driver) and overhead costs. For example the ABC study may have identified the volume of output as a cost driver of machine leasing costs, but if the machines are held on annual leases then the leasing cost is a fixed one for the year and will not vary from month to month. Since the regression model is based on monthly data and is to be used to forecast monthly overhead, the only independent variables used should be those there appears to be a short-run monthly variable relationship between the cost driver and overhead costs.

Part (b):

The website Oracle.com defines the Internet of Things (IOT) as follows:

- “The network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools”.

An example of how, as a consumer, someone might be concerned or worried about the impact of IOT:

- I may have less control over an Internet-connected device than over a more traditional phone. For example, if I purchase the rights to an electronic copy of a book or music, the seller can (in practice) modify that content without my consent or input (e.g., change a book’s cover or cease to make music available from the website from which I originally purchased and streamed it).

Purpose of the question; essential elements of the answer and acceptable variations:

- The purpose of the question is to assess whether candidates have a knowledge of predictive analytics (specifically, the use of regression for this purpose) and the Internet of Things (IOTs).
- It is essential that (as requested) candidates are able to identify the key weaknesses of the proposed approach to developing a regression model (in part [a]) and that they explain the IOT and give an example of the types requested (in part [b]).
- Alternative valid examples are of course acceptable especially in answers to both parts. Also, as indicated above, the level of detail presented here in the sample answer to part [a] above is greater than expected under examination conditions

END OF PAPER