

Review Article

# Using Computer Model in Management Accounting Assessments in Tertiary Institutions

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**Abstract**

The growing numbers of students taking accounting courses in tertiary institutions and the demand on lecturers to give effective feedback on course works have necessitated the use computing device in accounting assessments. The paper develops a model using computer spreadsheet for assessing students' assignments in management accounting. The feedback received from the use of the model shows that it's very effective in both marking students' assignments and giving effective feedback.

**Keywords:** Computer; Assessment; Accounting; Feedback; Students

## Introduction

### Setting basic accounting problem

The starting point of generating the computer model for management accounting is by enlisting the enrolment number of all students attending the accounting course. The setup is similar to the IAQ developed by Nnadi and Rosser [1] but with some modifications. Students are usually issued with enrolment numbers at point of registration which identifies them in the college or university. The range of the number of digits varies from institutions. A typical Student Enrolment Number (SEN) may have a maximum of 8 digits. The students are then given clear instruction to fill their SEN in the boxes to correspond with the alphabets. A student with a SEN of 2010001 will fill the boxes below as shown in Table 1.

Once the SEN have been correctly entered, the process of generating values in the accounting question becomes very simplified. However the SEN have to be decomposed into 'digits' using a basic excel skill. For a student with SEN 2010001; the following process would be undertaken:

1. Divide by 1,000,000 (which gives 2.010001) and rounding down. (This example rounds to 2).
2. Dividing by 100,000 and rounding down and subtracting the first digit obtained in step (1) after multiplying it by 10. (Thus 2010001 divided by 100,000 and rounded down gives 20, less  $2 \times 10 = 0$ ).
3. Dividing by 10,000 and rounding down and subtracting the first digit obtained in step (1) after multiplying by 100 and then subtracting the second digit obtained in step (2) multiplied by 10. (Thus 2010001 divided by 10,000 and rounded down gives 201, less  $(2 \times 100) + (0 \times 10) = 1$ ). Continue until the last figure.

Although this method may seem rather cumbersome, it is relatively straightforward to build the set of calculations into an Excel spreadsheet, as in below tables. Note, that 0.5 has to be subtracted from the numbers obtained by dividing by 1,000,000, 100,000, etc., before using the Excel ROUND function, otherwise numbers ending in 0.5 or more will be rounded up instead of down. Using the set of

formulae shown in Table 2(a) will give the values shown in Table 2(b) in columns B to H. Once created, this section of the spreadsheet can then be reused for other assessments.

Chandler and Marriott [2] examined various ways on the use of spreadsheet packages in accounting assessments and the desirability of flexibility in developing spreadsheet models. Similar studies on the various approaches to spreadsheet design have also been put forward and critically reviewed. Keller [3] demonstrates an improved method of service department cost allocation using the functionality of spreadsheets. Even in cases where it would be appropriate to use reciprocal costing; it has been noted that the reciprocal costing method may be passed up in favour of sequential or direct methods. Common reasons cited for this include lack of computing power, lack of training on solving systems of equations. Thus to improve spreadsheet knowledge in the accounting profession, Beaman, Waldmann and Krueger [4] advocate that accounting educators should include courses in spreadsheet design principles and problem solving techniques.

Lehman and Herring [5] developed 'an interactive electronic spreadsheet' that enables accounting educators to provide students with immediate feedback regarding the accuracy of their accounting solutions. The system provides immediate feedback using an answer-until-correct approach that can help students acquire and retain knowledge. The approach enables students to use spreadsheet in creating formulas to complete accounting problems. Correct solutions are denoted by a change in font colour. Security features prevent students from locating the correct answers stored in an adjacent area. However, the spreadsheet has limited applicability to basic financial accounting problems and does not individualize questions.

The current technique is primarily developed to assist accounting tutors who are involved in delivering and assessing

**Table 1:** Student with a Student Enrolment Number (SEN) of 2010001 will fill the box.

Instruction:	Fill your SEN under the alphabets below.						
SEN	B	C	D	E	F	G	H
2010001	2	0	1	0	0	0	1

**Table 2(a):** Decomposing Student Enrolment Number (SEN) into using spreadsheet.

	A	B	C	D	E	F	G	H
1	SEN							
2	2010001 <sup>2</sup>	=ROUND (A2/1000000-0.5,0)	=ROUND (A2/100000-0.5,0)-B2*10	=ROUND (A2/10000-0.5,0)-B2*100-C2*10	=ROUND (A2/1000-0.5,0)-B2*1,000-C2*100-D2*10	=ROUND (A2/100-0.5,0)-B2*10,000-C2*1,000-D2*100-E2*10	=ROUND (A2/10-0.5,0)-B2*100000-C2*10,000-D2*1,000-E2*100-F2*10	=ROUND (A2-0.5,0)-B2*1,000000-C2*100000-D2*10,000-E2*1000-F2*100-G2*10
3	2010002							

**Table 2(b):** Decomposed SEN using spreadsheet.

	A	B	C	D	E	F	G	H
1	SEN							
2	2010001	2	0	1	0	0	0	1
3	2010002	2	0	1	0	0	0	2
4	2010003	2	0	1	0	0	0	3
5	2010004	2	0	1	0	0	0	4

students' knowledge on various accounting subjects. It encourages independence of work and allows for easier assessment of students understanding in important financial and management accounting preparations. It aids insight on the intricacies of deriving the figures.

**Dealing with complexities in SEN**

All students need to have acceptable values for variables and answers for their individualized problems. However, if we simply let specific digits in their SEN represent specified variables, such as cost of capital, this can cause problems. For example, if student James Bond has the SEN 0000007 then if digits FG represent the cost of capital in an investment appraisal problem, inputting cost of capital of 0.0% will probably give this student an unrealistic problem to solve

and may lead any calculations into a dead end.

To cope with this problem, it is often best to set up problems with numbers that are a mixture of given digits, that will be the same for each student, and their digits depend on the SEN. For example, in an investment problem the interest rate could be specified as 5.DE%. This would mean student number 0000007 would use 5.00%, which is realistic, and other students would also have interest rates within a close range but still different, and therefore leading to different answers.

Even if the above precautions are taken, it may still be possible for a particular SEN to give an unrealistic answer, such as a negative output. However, it is very simple to test for this problem. The Excel formulae for a set of problems can just be copied down the worksheet page so that answers are computed for all SEN. It is then easy to spot any anomalous answers and make any necessary adjustments to the question parameters.

**Management accounting applications**

The computer model can be used to set up management accounting questions. The process follows the same pattern and can be used in all key areas of management accounting including cost volume profit

**Table 3(a):** Setting up computer model in CVP analysis.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	SEN								SP	VC	FC	CPU	BEP(unit)	BEP(£)
2	2010001	2	0	1	0	0	0	1	=10+H2	=1+0.1*H2	=H2*10000+5*1000+G2*100	=I2-J2	=K2/L2	=M2*I2
3														

**Table 3(b):** Individualized CVP solutions.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	SEN								SP	VC	FC	CPU	BEP(unit)	BEP(£)
2	2010001	2	0	1	0	0	0	1	=10+H2	=1+0.1*H2	=H2*10000+5*1000+G2*100	=I2-J2	=K2/L2	=M2*I2
3														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	SEN								SP	VC(£)	FC(£)	CPU(£)	BEP(unit)	BEP(£)
2	2010001	2	0	1	0	0	0	1	11	1.00	15,000	10	1,500	16,500.00
3	2010002	2	0	1	0	0	0	2	12	1.10	25,000	10.9	2,294	27,522.94
4	2010003	2	0	1	0	0	0	3	13	1.20	35,000	11.8	2,966	38,559.32
5	2010004	2	0	1	0	0	0	4	14	1.30	45,000	12.7	3,543	49,606.30
6	2010005	2	0	1	0	0	0	5	15	1.40	55,000	13.6	4,044	60,661.76
7	2010006	2	0	1	0	0	0	6	16	1.50	65,000	14.5	4,483	71,724.14
8	2010007	2	0	1	0	0	0	7	17	1.60	75,000	15.4	4,870	82,792.21
9	2010008	2	0	1	0	0	0	8	18	1.70	85,000	16.3	5,215	93,865.03
10	2010009	2	0	1	0	0	0	9	19	1.80	95,000	17.2	5,523	104,941.86

**Table 4(a):** Setting up NPV calculations.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1									Yr.1	Yr.2	Yr.3	DF@9%	PV-1	PV-2	PV-3	NPV
2	SEN								Cost =	4000		1				
3	2010001	2	0	1	0	0	0	1	=H3*1000+5*100	=H3*1000+G3*100	=H3*1000+D3*100	=1/(1.09)^H3	=I3*L3	=J3*L3	=K3*L3	=SUM(M3:P3)-J\$2

**Table 4(b):** Individualized NPV solution for each student.

	A	B	C	D	E	F	G	H	I	J	J	K	L	M	N	O
1	SEN								Yr.1	Yr.2	Yr.3	DF@9%	PV-1	PV-2	PV-3	NPV-A
2									Cost =	4000						
3	2010001	2	0	1	0	0	0	1	1500	1000	1100	0.9174	1376.15	917.43	1009.17	-697.25
4	2010002	2	0	1	0	0	0	2	2500	2000	2100	0.8417	2104.20	1683.36	1767.53	1555.09
5	2010003	2	0	1	0	0	0	3	2350	3000	3100	0.7722	2702.64	2316.55	2393.77	3412.96
6	2010004	2	0	1	0	0	0	4	4500	4000	4100	0.7084	3187.91	2833.70	2904.54	4926.16
7	2010005	2	0	1	0	0	0	5	5500	5000	5100	0.6499	3574.62	3249.66	3314.65	6138.93

**Table 5:** Marking grid.

	A	B	C	D	E	F	G	H	---	O
1	SEN									NPV
2										
3	2010001	2	0	1	0	0	0	1		-697.25
4	2010002	2	0	1	0	0	0	2		1555.09
5	2010003	2	0	1	0	0	0	3		3412.96
6	2010004	2	0	1	0	0	0	4		4926.16

analysis, investment appraisal, transfer pricing etc. The examples that follow highlight the application of the model in assessing students understanding in common management accounting problems.

**Example 1:** Using computer model programme in cost volume profit analyses

A manufacturing firm incurs the following costs in the production of its product:

Selling price (SP) = £1H per unit

Variable cost (VC) = £1.H0 per unit.

Fixed costs (FC) = £H5, G00.

Use the above information to calculate the Contribution per Unit (CPU), Breakeven Point (BEP) in units and pound value.

Note that in the excel set up below, the CVP components have been programmed according to their corresponding digit alphabets.

Once the model has been programmed as in Table 3(a) above, the formulae can be copied down the spreadsheet. Note the treatment of fractional or decimal figures as in the variable cost (VC) of £1.H0. Table 3(b) shows the expected results from the students.

**Example 2:** Using computer model programme in investment appraisal

The following example illustrates how the computer model can be

used in setting up questions in investment appraisal. The technique involves altering the cash inflows such that each student has different values. An example is given below:

A company is considering investing £40,000 in a production project. The projected cash inflows from the project for 3 years are as follows:

**Year Cash inflow**

- 1 H, 500
- 2 H, G00
- 3 H, D00

Calculate the Net Present Value (NPV) of the project assuming the cost of capital is 9%.

Note that students will have to use the corresponding numerical digits for H, G and D in their SEN to compute the NPV. This inevitably gives different values and allows for independence particularly in a crowded group. Tables 4(a) and (b) present the programming and solutions to the question respectively.

Once set up, the formulae are copied down to the last SEN and the completed solution is shown in Table 4(b).Where more than one project is being calculated, the procedure is same and extended to compute for several projects and the results compared for decision on the best project. Other investment appraisal techniques such as accounting rate of return, payback period and internal rate of return can also be set up using similar process.

In the above NPV example, we have demonstrated how this process can be used by altering the cash inflow values for each student. However, the cost of capital can also be altered making each student to work with different discount factor. Thus, the programme allows for differentiation of questions in different manners

**Creating a marking grid**

Where an accounting assessment has different questions, the set-up of the spreadsheet will involve several columns which become

more cumbersome. To make the marking process easy, a simple grid that shows the student enrolment numbers and the final solutions that will fit in one page width (landscape if necessary) is created. Rosser [6] outlines a simple process of creating a marking grid as follows:

- Label the worksheet page used to create students' answers as explained in the previous sections as 'Full Workings'.
- Go to the next worksheet page and label the tab 'Answer Grid'. Make a full copy of the Full Workings worksheet by typing = in cell A1 of the Answer Grid worksheet

And then clicking on cell A1 in the Full Workings worksheet and hitting return.

- The formula box for cell A1 on the Answer Grid showing should then be dragged and copied over the whole of the Answer Grid worksheet until all the cells from the Full Workings worksheet are copied.

Cells that were blank on the Full Workings worksheet will appear as zero and can be cleared to tidy things up. The columns that are no longer needed for the answer grid can be deleted. The NPV calculations above can thus be abridged to show only the Student Enrolment Numbers (SEN) and the NPV values for the project by creating the Answer grid sheet. This will appear as shown on Table 5 below.

The tutor may however choose to include more parts of the calculations such as the Present Values (PV) etc from the spreadsheet. By creating the answer grid, the spreadsheet becomes simplified and the solutions become more focused for ease of marking.

## Conclusion

The large group of students attending accounting modules makes the relevance of a programme that, not only tailor-make questions for each student but reduces any risk of collusion urgently necessary. This technique would help to promote independent learning and allows instructors to deliver individualized questions to students with minimal effort. The approach also allows students, at their own discretion, to get individualized help and feedback.

In a crowded accounting class, the idea of giving a coursework to a group of 500 students and carefully marking and giving a feedback can be daunting. This programme makes the arduous task of marking easier, ensures independent work among the students and highlights points of departure where a student goes wrong.

The importance of ensuring independence by discouraging dishonest collusion in accounting assessments among students has become vital. With the large number of students attending accounting modules in higher institutions, the risk of malpractice has increased. Freeman et al. [7] calls for a more collaborative approach to tackling academic dishonesty. This involves undertaking empirical studies to reduce any such practice. The approach explained in this paper has been experimented and found to be superbly relevant in tackling any such problems in accounting class.

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