Management and Cost Accounting

THIRD EDITION

SPREADSHEET APPLICATIONS MANUAL: GUIDANCE NOTES AND DISK

ALICIA M. GAZELY

CHAPMAN & HALL

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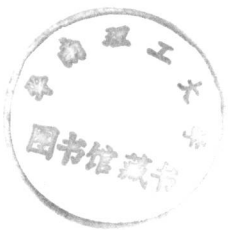

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Spreadsheet Applications Manual: Guidance Notes and Disk

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*The Dutch Students' Manual to accompany the third edition of *Management and Cost Accounting* by Colin Drury, is not published by Chapman & Hall, but is available from Interfass, Onderzoek en Advies, Postbus 76618, 1070HE, Amsterdam. Tel. (020) 6 76 27 06.

Contents

Introduction

The *Spreadsheet Applications Manual* is not a manual on spreadsheets. Its purpose is to enable the student gain a deeper understanding of management and cost accounting through using, and perhaps building, spreadsheets. Each spreadsheet relates to an example, exhibit or SAQ in Colin Drury's book *Management and Cost Accounting* (third edition), therefore the answer or explanation is available to the student. What the spreadsheet offers is a medium for experiment and exploration; and if the student builds the model too, he or she will gain valuable spreadsheet skills.

I have not assumed the use of any particular spreadsheet package, but details are given for two, SuperCalc5 (Version 5.0) and Lotus 1-2-3 (Release 2.01) and space is included to write details of other packages in the tables in the text which show techniques. The student needs some knowledge of the operating system in use, sufficient to log on if necessary, format disks, view disk directories, make back-up copies of files, and load the spreadsheet package available. The Manual includes a section "Spreadsheet Basics" which would enable a beginner to start using the package; the amount of help needed may be no more than a little troubleshooting if the package is one of the two featured in the Manual.

The designs in the Manual are often referred to as *models*, meaning representations of problems from the Drury text. This reflects the fact that there are many possible ways of implementing the model using a spreadsheet, and other ways too, such as using a piece of paper or a financial modelling package. The designs demonstrate only one possibility. They are, however, highly structured. The details are shown in Section I of the Manual, "Spreadsheet Design and the Template": the purpose is to minimise the time to be spent in getting to grips with a new design and implementing a new problem, since the various elements are kept separate and in a consistent order - spreadsheet details, data, calculations, report areas, and input for graphics. This may not always seem necessary - the smallest spreadsheet (BRECK) has one screenful of calculations, taking up only a quarter of the spreadsheet's area. But the value of consistency is that a new user of the model, or someone who wants to build in other calculations than those provided, already knows exactly where everything is and where to build.

The designs are presented in the form, effectively, of diagrams. This is a device to get away from the form in which instructions for building spreadsheets are often presented, in a linear fashion which does nothing to provide an overview of what is going on and can encourage the person using the instructions to follow mechanically. It would be possible to follow these designs mechanically, but I hope that the user will at least be encouraged by the non-linear diagrams to follow the design on paper first and understand it.

A disk is provided to tutors which includes all the finished spreadsheets, normally for both SuperCalc5 and Lotus 1-2-3 (.CAL and .WK1 files respectively). The disk also includes a template (TEMPLE.CAL and TEMPLE.WK1) which should be used where possible for building spreadsheets from scratch - and the template, but not the other files, are mentioned in the introduction to the Manual. Each design includes details of how to alter the template to fit the requirements of the design, which usually means blanking out unwanted areas. Sometimes column widths are to be altered and occasionally columns are to be inserted or removed, but alterations have been kept to a minimum.

Three sections of the Manual have been mentioned so far: on spreadsheet design and the template, on spreadsheet basics, and the 23 models themselves. The final section "Advanced Techniques" collects together techniques to provide a reference from the designs when something special is required. It can also be used as a reference in its own right, since it is in alphabetical order. The section does not claim to be comprehensive, and a student wishing to go further should consult the spreadsheet program manual.

This tutor's manual includes a little more detail on each design, and an indication of the difficulty to be encountered in implementing each one as a spreadsheet. A final section for each, "What-if analysis", offers suggestions for further work. I would welcome your comments on both the *Spreadsheet Applications Manual* and this one - and to hear how you got on with using the models in your teaching. Good luck!

Student activities

The suggestions in this manual for student what-if activities vary from design to design and you may see an idea for one design which could be applied to another. I have chosen the ones which seemed most appropriate or interesting, but generally avoided suggesting large-scale amendments to the spreadsheet. This is because the acquisition and exercise of advanced spreadsheet skills would be, in the present context, something of a bonus along with the main business of gaining a deeper understanding of management and cost accounting, but in fact such activities are quite easy for the tutor to initiate and are absorbing and rewarding for many students.

Activities for students for class work and assessed work fall into several general categories. These are listed below - not all of them have been used in this manual.

1 Change the data - how do the results differ? Could the student predict the direction of the difference, or write out the workings to produce the same effect?

2 Change the data - what is the meaning of the change in the model's output? What kind of scenario does the changed data suggest, and what would be the consequences of the changed result for the business?

3 Provide new data set(s) - can the student load and use the model and produce appropriate output?

4 Provide new problems - can the student pick the data out of the question and use the model to get an answer?

5 Can the student produce a table of outcomes from a sequence of changes to the data? The student should be encouraged to split the screen into windows for this kind of repetitive use of the model. For something involving random numbers like the Monte Carlo analysis in MONTE, each table will be slightly different, adding to the interest.

6 Can the student devise a data set which produces a certain result? For example, nil profit or a large difference between two measures of the same thing - and then explain why the data set has that effect?

7 What change in one data item will produce a given effect - for example, what increase in sales volume?

8 What effect would an error in one of the data items have? If a "true" value is given, then running the model with the erroneous and then the true values will provide two sets of data for comparison.

9 What sensitivity is displayed by the input data - what percentage change in the output does a small change in the input data cause?

10 Can the student explain, in normal English, the meaning or purpose of a given cell entry? It is useful to give the student an example of such an explanation first. For example, the meaning of a cell entry AG85/AG89 might be "Divide the budgeted overheads by the total of the budgeted machine hours for the three products" and its purpose to provide an overhead absorption rate per machine hour. IF( ) statements often provide plenty of scope for this activity.

11 Can the student prepare (and save) a graphic to illustrate the output of the model?

12 How could the model be improved - for example, what simplifying assumptions does it incorporate?

13 How could the spreadsheet be improved - to be more efficient, or clearer, or provide further information?

14 Can the student alter the spreadsheet to incorporate, for example, an extra product, or automate some function of the spreadsheet with macros?

Reminders for students

Cursor movements

PageUp, PageDown, and the Control-left arrow and Control-right arrow keys move the cursor in screen sized jumps, making it easy to navigate between model screens.

Typing the date into the HOUSE screen

If the date typed in looks to the spreadsheet program like a formula (for example, 1/1/93 or 1-1-93) the result will be shown in the cell. To avoid this, be sure to enter quote marks before typing in the date.

Today's date in the HOUSE screen

This date will only change when the spreadsheet is recalculated; therefore, if recalculation has been set to manual, the recalculate command (F9 key) has to be executed.

Model names and filenames

The model name is typed into cell A1 and the file name into cell H4. In the model designs as illustrated these names are the same; but if a spreadsheet is created over several sessions or in more than one version, it is useful to record the file name in the spreadsheet itself so that it is visible on the screen and on paper. For example, the first model might be built as spreadsheets PAY1.CAL, PAY2.CAL or (Lotus 1-2-3) PAY1.WK1, PAY2.WK1, and so on.

The list of screens and range names in the HOUSE screen

If the model is to be built according to the design the list of screens in rows 13 to 19 can be edited straight away. The command /Blank (SuperCalc5) or /Range,Erase (Lotus 1-2-3) will often be needed. Similarly, the list of ranges in C25:D36 can be blanked out straight away.

Naming several cells at once

It is possible to take a short-cut when naming cells by naming a group at once. For example, in the DATA screen in PAY (page 26) there are 15 cells to be named. To name the first group, the command is /Name, Labels, Left, P43:P50 (SuperCalc5) and /Range, Name, Labels, Left, P43:P50 (Lotus 1-2-3). Labelling a range with gaps in it can cause strange effects, so it is safer to do it in sections.

Copying formulae

When a formula is copied which includes relative references, the results showing in the destination cells will normally be different. However if recalculation has been set to manual, the result will not show straight away, so the F9 key has to be used. In a large spreadsheet this recalculation may seem to take a long time; if there are only one or two destination cells, it may be quicker to position the cursor over the cell and pretend to edit it (F2) then press Return straight away; this has the effect of recalculating only the "edited" cell.

Moving formulae

When a cell or block of cells is to be moved to a new location without any change to its contents, moving is better than copying, because the program will automatically change references to the moved block in other parts of the spreadsheet.

Shortcuts checklist

This is at the end of the Spreadsheet Basics section, but is reproduced here too.

SHORT-CUTS CHECKLIST	
Move round the spreadsheet quickly	Especially PageUp, PageDown, Home, Ctrl ← and Ctrl →, F5 (the GoTo function key)
Point rather than type in ranges (and positioning the cursor before calling up the menu helps)	When specifying ranges or even single cells
Use a dot when specifying ranges - and inside formulae	Instead of : or ..
Use absolute or partly absolute cell references before copying	See also section on Advanced Techniques:Copying cell entries, for use of F4 key
Use the on-line help	Usually the F1 key
Use copying not typing, where possible	Applies to both formulae and text
Use initial letters of commands instead of moving the cursor in menus (if you have done enough typing to be able to find the letters quickly!)	e.g. /FE (SuperCalc5) or /RF (Lotus 1-2-3) to format

PAY design

Chapter 3, SAQ 2 (question page 59-60, answer pages 835-836)

This question builds on the text on pages 55 to 58 relating to labour costs. The Betayet company is considering an incentive scheme involving piece rate rather than time rate for its operatives, and the question also asks for a calculation of the effect on profit of a labour dispute.

The spreadsheet model sets out the calculations in four screens:

CALC1 maximum output levels for the current situation, and the proposed scheme

CALC2 total labour cost for each situation

CALC3 profit / loss for the same conditions, incorporating the labour cost calculations from CALC2. This screen corresponds to the answer for part 1 of the question.

CALC4 the consequences of the labour dispute. A reduction in paid overtime has been assumed so that the formulae in row 138 incorporate the overtime saving shown separately in row 133. This screen corresponds to the answer for part 2 of the question.

CONSTRUCTING THE SPREADSHEET

This spreadsheet is not difficult to construct, and closely follows the workings in the answer to the SAQ. For maximum accuracy, some data values should be entered as formulae rather than straight numbers: this also makes it easier to carry out the what-if analysis below as the contents of cell O57 can be edited easily.

O48	Overtime rate	4/3	gives 1.666667
O49	Units per hour (current)	60/40	gives 1.5
O57	Units per hour (scheme)	60/30	gives 2

WHAT-IF ANALYSIS

The most interesting data item to change is likely to be the standard operator time per unit under the proposed scheme, since this will have been estimated on the basis of little or no experience of how the operatives are in fact going to react to the scheme. The time per unit is estimated to reduce from 40 minutes per item to 30 minutes, a reduction of 25%. What are the consequences of different estimates?

The most straightforward method of answering this question is of course to put in different values for "Units made per hour" in the DATA screen, row 57.

The results of such an analysis are shown in the table on the next page (the values of 30 minutes and 40 minutes of course represent the estimate given in the question and the current standard time, respectively).

The number of minutes is entered in cell O57 as the divisor, e.g. 60/20, 60/22. but the value shown below for "STIM" is what appears on the screen.

For clarity the block AN106 to AR116 can be formatted in integer format (zero decimal places).

From the table on the next page it can be seen, for example, that pay for the current maximum level of production (900 units) includes overtime when the time lengthens over 26 minutes; labour cost jumps from £1800 to £1820 at this point. The exact time is 900/400 = 2.25 units per hour, or 26⅔ minutes per unit.

Similarly, at the minimum level of production of 450 units the profit changes to a loss between 32 minutes (£30 profit) and 34 minutes (£15 loss). The exact time can be found by calculating a break-even standard time for this situation in which a minimum weekly wage is being paid by agreement (£120 x 10 people). The fixed costs to be covered by the contribution are therefore £2400: £1200 fixed overheads and £1200 wages. The sales revenue is £9.00 and material cost is £2.00, but the variable overhead cost is incurred depending on the hours worked, and this in turn depends on the time per unit achieved.

The required contribution is £5.33 (£2400 / 450 units), and the variable overhead element is £1.67 (£9.00 - £2.00 - £5.33). At £3 per hour this represents (1.67 / 3) = 0.56667 units per hour, or (0.56667 x 60) = 33.4 minutes per unit.

Students might be asked to produce such a table and offer an analysis, perhaps including graphs as illustration.

Minutes	DATA Cell O57 "STIM" Units per hour	CALC3 Cell AR106 Maximum units	CALC3 Labour (Row 111) Profit/Loss (Row 118)		
			Minimum	Current	Maximum
20	3	1800	1200	1800	3800
			300	2400	5800
22	2.727273	1636	1200	1800	3473
			255	2310	4982
24	2.5	1500	1200	1800	3200
			210	2220	4300
26	2.307692	1385	1200	1800	2969
			165	2130	3723
28	2.142857	1286	1200	1820	2771
			120	2020	3229
30	2	1200	1200	1850	2600
			75	1900	2800
32	1.875	1125	1200	1880	2450
			30	1780	2425
34	1.764706	1059	1200	1910	2318
			- 15	1660	2094
36	1.666667	1000	1200	1940	2200
			- 60	1540	1800
38	1.578947	947	1200	1970	2095
			-105	1420	1537
40	1.5	900	1200	2000	2000
			-150	1300	1300

RATES design

Chapter 4, SAQ 1 (question pages 87-88, answer pages 836-837)

The Bookdon Public Limited Company has two production departments and two service departments, and manufactures three products. Some overheads are allocated directly to departments, others are to be apportioned, and finally an overhead absorption rate per unit is calculated to allow the calculation of cost per unit.

The spreadsheet model sets out the calculations in three screens:

CALC1 Rent is apportioned on the basis of floor area, and depreciation and insurance on the basis of book value of equipment, across the four departments. Finally canteen expenses are distributed between the two production departments on the basis of the number of employees and maintenance expenses on the basis of the proportion of 70% given in the question.

CALC2 Total costs for each production department are picked up from the previous screen. The total of machine hours or labour cost is calculated in column AE from data in the DATA screen, and overhead absorption rates calculated in column AH.

CALC3 The overhead rates per unit from CALC2 are used to give cost per unit for each shop and finally total cost, for each of the three products (the question asks for product X only).

CONSTRUCTING THE SPREADSHEET

This spreadsheet is not difficult to construct. The dotted lines in the CALC1 screen (row 70) should be put in using Repeating text, and copied to rows 73, 76 and 78.

WHAT-IF ANALYSIS

Any of the data items can of course be changed. For example, suppose that the budget is revised to reflect changed circumstances; a vital machine in the fitting shop is ageing badly. This could mean two workers moving from the machine shop and a greater proportion (say 40%) of maintenance costs being incurred servicing the fitting section.

The results, shown below, reveal that the cost of product Z, which takes a lot of fitting time, has gone up considerably.

DATA BUDGET

	Product X	Product Y	Product Z
Production (units)	4200	6900	1700
Prime cost per unit (£):			
Direct materials	11	14	17
Machine shop labour	6	4	2
Fitting section labour	12	3	21
Machine hours per unit	6	3	4

	Machine Shop	Fitting	Canteen	Maint.	Total
Allocated overheads	27660	19470	16600	26650	
Rent etc.					17000
Depreciation & insurance					25000
Equipment book value	150000	75000	30000	45000	
No. of employees	16	16	4	4	
Floor space (sq.m.)	3600	1400	1000	800	
Maintenance: servicing	60%	40%			

CALC1 OVERHEAD ABSORPTION RATES

	Machine Shop	Fitting	Canteen	Maint.	Total
Allocated overheads	27660	19470	16600	26650	90380
Rent etc.	9000	3500	2500	2000	17000
Depreciation & insurance	12500	6250	2500	3750	25000
	49160	29220	21600	32400	132380
Canteen	9600	9600	-21600	2400	0
	58760	38820	0	34800	132380
Machine maintenance	20880	13920		-34800	0
	79640	52740	0	0	132380

CALC2 OVERHEAD ABSORPTION RATES

MACHINE SHOP			
Budgeted overheads		79640	
Budgeted machine hours			
Product X	25200		
Y	20700		
Z	6800	52700	
Rate per machine hour			1.51
FITTING SECTION			
Budgeted overheads		52740	
Budgeted machine hours			
Product X	50400		
Y	20700		
Z	35700	106800	
Rate per machine hour			49%