A Structured Process for Spreadsheet Review

Driving Healthcare Decisions Through Analytics

A STRUCTURED PROCESS FOR SPREADSHEET REVIEW

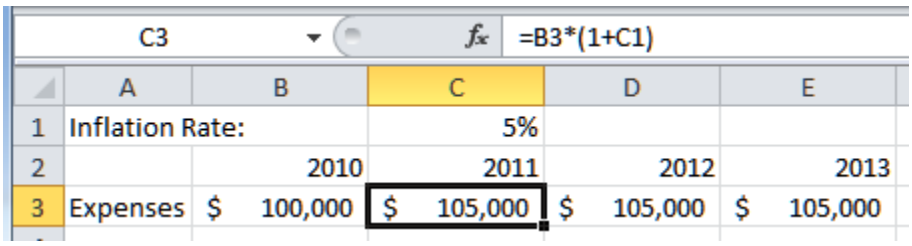
Few computer programs are more ubiquitous to an industry than Microsoft Excel is to the finance and accounting Industries. Spreadsheets are used in almost every financial application by a wide variety of staff levels. A major contributing factor to their wide acceptance is their flexibility and lack of enforced structure. While this flexibility contributes greatly to their functionality, it also creates a significant opportunity for error.

While there are countless books, articles, videos, and training sessions on how to build spreadsheets, there appear to be few resources for how spreadsheet should be reviewed. Many organizations appear to lack a structured process for reviewing spreadsheets for accuracy. Thus, many reviewers may be unaware of the multitude of tools available to assist them in identify common errors in spreadsheet design.

This article focuses on reviewing spreadsheets, not on creating them, and lays out a structured process that can be followed in an attempt to detect errors in a spreadsheet. While no review process can be assured of identifying all errors, the object of this process is to identify common errors in spreadsheet design and the use of various review tools that are built into Excel.

This process relies on two major areas of knowledge. First, the reviewer must understand the objective of the spreadsheet being reviewed, and the business rules that are implicit in the spreadsheet model. He must be able to identify errors in design that do not properly implement these business rules, and must be able to design tests that will identify areas in which business rules are not properly implemented. For example, when reviewing a spreadsheet for a capital purchase, the reviewer must understand how the asset is being financed, and be able to identify whether an incorrect loan interest rate is being used. Similarly, reviewer should be able to vary the project's basic assumptions (volume, payment rates, inflation factors, etc.) and assure that those factors affect the outcome of the model in the expected way. This "analytical review process" will be discussed later in this article.

The second major skill set is understanding the mechanics of spreadsheets, and in particular the types of errors that are likely to occur. For example, a common error in copying a formula is to use a relative reference where an absolute reference is required. This could occur, for example, when using a single inflation rate to inflate a series of annual cost amounts. In the example below, the reference to the inflation rate in cell C1 is entered incorrectly as a relative reference, rather than absolute reference. When copied to the 2012 and 2013 years, those formulas erroneously refer to cells D1 and E1 for the inflation rate, which are zero, instead of referring to the correct inflation rate in C1. The correct cell reference would be:



	A	B	C	D	E
1	Inflation Rate:		5%		
2		2010	2011	2012	2013
3	Expenses	$ 100,000	$ 105,000	$ 105,000	$ 105,000

Other similar types of errors include use of constants in areas where formulas should occur, creation of circular references, out-of-date values in a linked worksheets, numbers entered as text values and other similar errors. Many of the tools and techniques described below are designed to identify these errors when they occur in the spreadsheet being reviewed. Understanding the most common types of errors is the first step to identifying in correcting them.

Anticipate common errors

To effectively identify errors in spreadsheets, the reviewer must be aware of areas where the most common errors occur. One research paper [1] identified the following as the areas of highest error:

Factors suggesting a high risk of error	Factors suggesting a significant risk of error
• Circular references • Cells displaying a number but storing text • Mixed formulas and values • Formulas evaluating to an error • VLOOKUPS and HLOOKUPS expecting ordered lists	• Links to external spreadsheets • Presence of hidden sheets • Hidden rows or columns • Conditional formatting • Pivot tables

These areas represent good starting points for review, and all occurrences of these items in a spreadsheet should be reviewed for correctness.

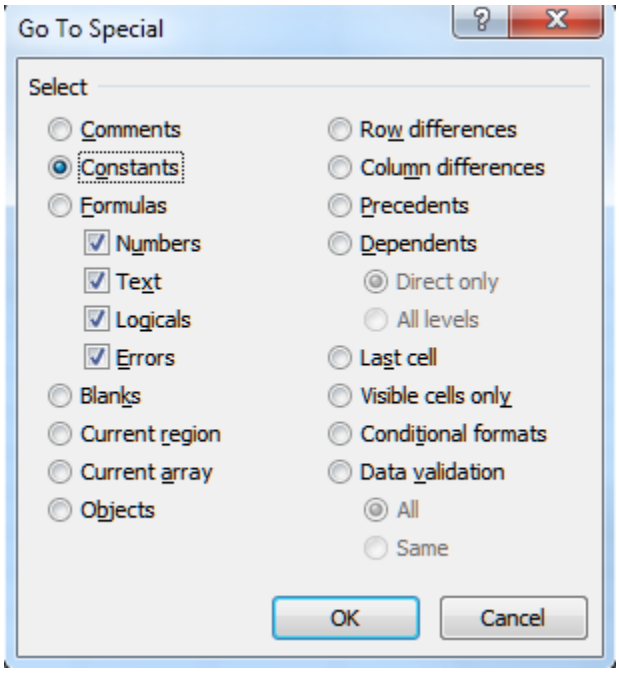
Check for constants where formulas should be present

An important structural check is to assure that constants are not present where formulas are expected. An example of this is shown below.

Infl rate	5%			
Department	2008	2009	2010	2011
Dept A	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Dept B	$ 4,000	$ 4,000	$ 4,400	$ 4,400
Dept C	$ 3,000	$ 3,000	$ 4,000	$ 4,000
Dept D	$ 2,000	$ 2,000	$ 2,000	$ 2,000
Total	$ 14,000	$ 14,000	$ 15,400	$ 15,400

In this example, the 2010 expenses for Department B should be calculated using a formula, but instead a constant ($4,000) has been entered into the cell. This error will not be apparent. This type of error can be identified utilizing the "GoTo> Special" command, which is accessed through pressing the F5 function key, as shown below:

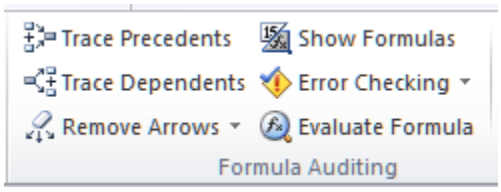
[1] *An Auditing Protocol for Spreadsheet Models*, Stephen G. Powell, Kenneth R., Baker, Barry Lawson, Information & Managment, 2008



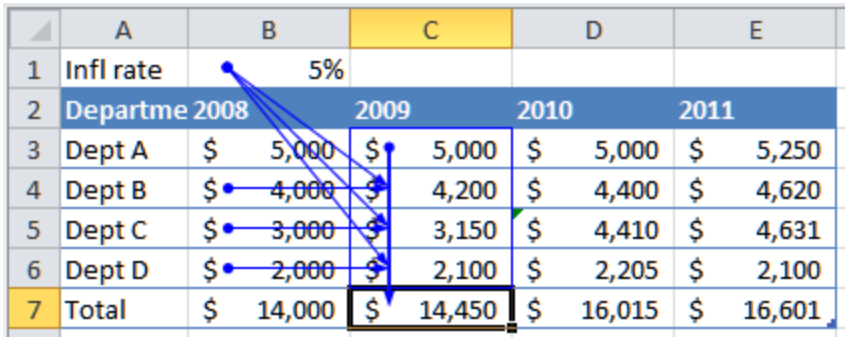
This command highlights the constants on the worksheet, which caused the background of the 2010 Department B cell to turn blue. This allows the reviewer to rapidly identify any cells containing constants and assure that they are correct.

Cell precedents and dependents

Tracing cell precedents and dependents allows to reviewer to visually identify formula references that appear incorrect. The "Trace Precedents" command is found on the Formulas menu under "Formula Auditing" as shown below:



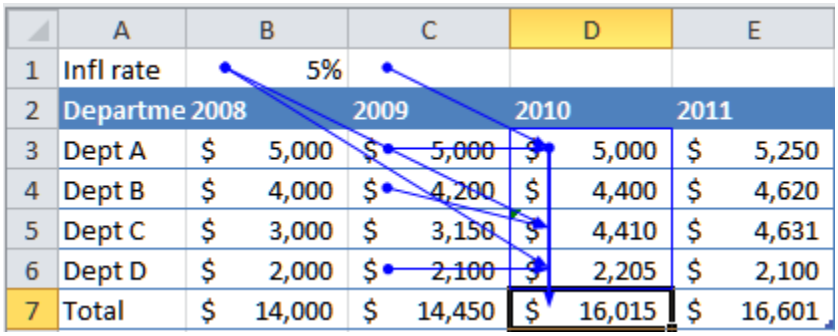
This command inserts arrows onto the spreadsheet showing cells that are referenced by the formulas contained in the current cell. Pressing the Trace Precedents button multiple times expands the list. This highlights the precedents of all cells referenced by C7, and also the precedents of all of those cells. This creates the result shown below:



	A	B	C	D	E
1	Infl rate	5%			
2	Departme	2008	2009	2010	2011
3	Dept A	$ 5,000	$ 5,000	$ 5,000	$ 5,250
4	Dept B	$ 4,000	$ 4,200	$ 4,400	$ 4,620
5	Dept C	$ 3,000	$ 3,150	$ 4,410	$ 4,631
6	Dept D	$ 2,000	$ 2,100	$ 2,205	$ 2,100
7	Total	$ 14,000	$ 14,450	$ 16,015	$ 16,601

Note that there is no arrow from cell C3 to cell B3 as would be expected, since the 2009 amount should be computed from the 2008 amount. This highlights an error in the calculation of the 2009 expenses for Department A.

A similar error can be identified with tracing the precedents for the 2010 total in cell D7.



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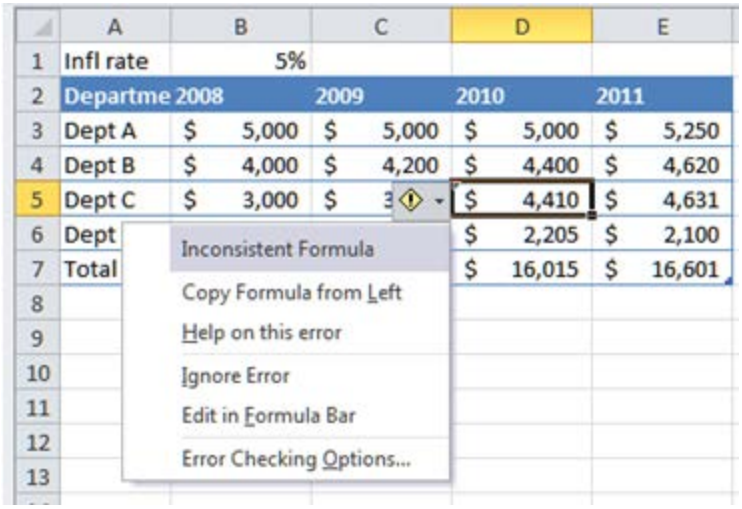
5	Dept C	$ 3,000	$ 3,150	$ 4,410	$ 4,631
6	Dept D	$ 2,000	$ 2,100	$ 2,205	$ 2,100
7	Total	$ 14,000	$ 14,450	$ 16,015	$ 16,601

Here an arrow flows from cell C1, which is blank. This causes the 2010 expenses for the department A to be inflated by an incorrect amount (zero). Similarly, there's no arrow flowing from cell C5, which should be used to compute D5. Instead, D5 is incorrectly computed from C4.

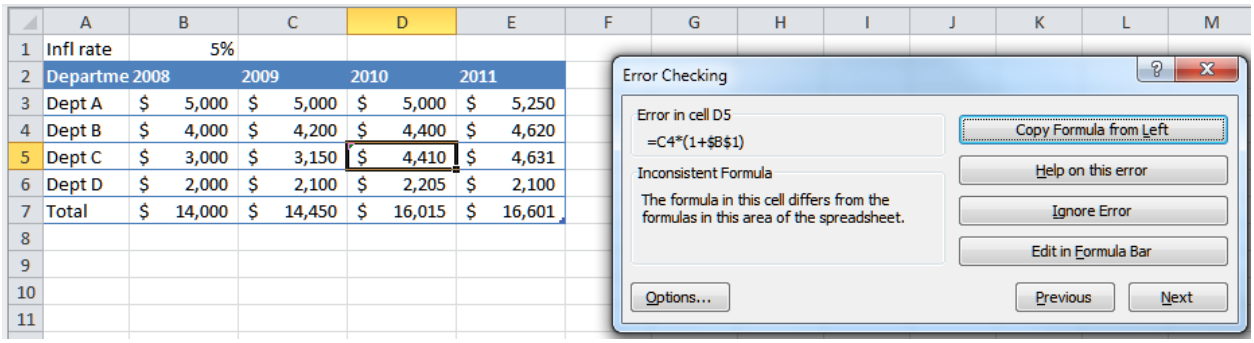
This process provides visual cues as to potential errors. By understanding how data should flow among spreadsheet cells, potential errors can be identified.

Using the Error Checking function

Excel attempts to identify a number of different types of potential errors, and will highlight these errors with a small green triangle in the upper left corner of a cell. Once such a cell is selected, the yellow exclamation point will appear. Clicking on that icon will display the suspected error and several options for correcting or ignoring it.



To identify all such errors in the spreadsheet, the Error Checking command in the Formula Auditing toolbar is used. This will highlight each error individually and allow the reviewer to decide how to handle it. This function works as shown below:



Not all "errors" identified by Excel in this way will be turn out to be actual mistakes, but this process does allow the reviewer to rapidly evaluate all such potential errors and correct or ignore them as appropriate.

Errors in linked workbooks

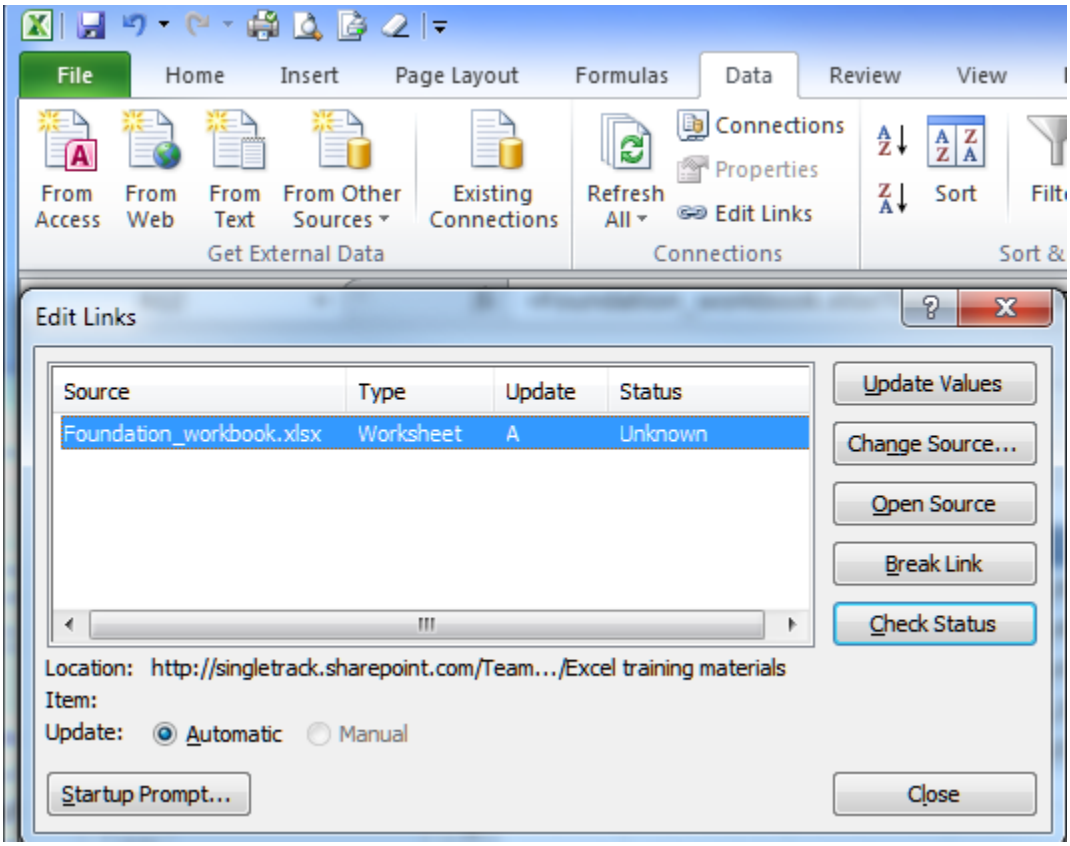
Many complex spreadsheets use links to transfer data between multiple spreadsheet files. This may occur, for example, when revenue calculations are performed in one spreadsheet while expense calculations are performed in a different spreadsheet. These sheets are then linked into a "summary" spreadsheet to create the income statement. The source workbook contains the data that's linked into the destination workbook through formulas in the destination workbook that refer to cells in the source. Potential problems occur when the source and destination workbooks are different Excel workbooks; they do not occur when all links are within the same Excel workbook.

Linked spreadsheets can create a number of different types of errors, including:

- Changes in cell values from the source spreadsheet not updating the destination spreadsheet. If the source worksheet is changed, but the destination worksheet isn't open at the same time (or if "update links" isn't selected from the Edit Links menu), the changes may not be reflected in the destination workbook.

- Changes in cell references in the source not reflected in the destination. Consider a source workbook (Book S) that contains the inflation rate in cell B2, and that cell is referenced in the destination workbook (Book D). If a new row 1 is added to Book S, the inflation rate is now in cell B3. If that row was added when Book D was not open, the change will not be reflected in Book D. Instead, Book D will now continue to contain the link to cell B2, which no longer contains the inflation rate.
- Users may copy workbooks to temporary locations, such as their desktop, and create links from those workbooks. Such a link may appear as "C:\users\jon\desktop\Source.xlsx". This link will not be available to any user other than "jon". Users should be sure not to link to local spreadsheets that will not be available to other users.
- Users may rename the source workbooks without changing the links in the destination workbooks. For example, a link from a workbook named "Reveune.xlsx" may exist in a workbook named "IncomeStatement.xlsx.". If the spelling of "revenue" is corrected in the workbook name, the links to that workbook will no longer work.

Links to other spreadsheets can be viewed from the Edit Links icon on the connections menu of the Data tab. This will display all workbooks that are linked into the current workbook.



Initially the status of a linked workbook will be "unknown". Pressing the "check status" button will update the status of that workbook. The following status values may appear:

- **OK** – the destination workbook has been updated with the most recent data in the source workbook
- **Source is open** – the source workbook is open; therefore the destination will automatically be updated whenever the sources changed

- **Warning: values not updated** – the source workbook exists but changes to the source may not have been updated in the destination
- **Error: source not found** – the source workbook cannot be found.

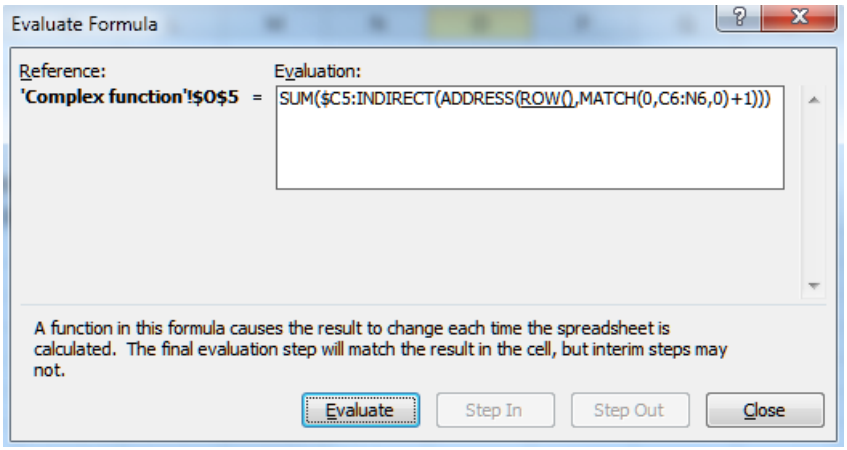
Of these errors, the last is the most problematic. It means that the workbook that contributed data to the workbook that you're reviewing no longer exists in the same location as it did when the link was created. If the source workbook can be found in a different location, the "Change Source" button on the Edit Links screen can be used to point all links in the destination workbook to the new location of the source. However, this is an error that's extremely difficult to correct, and should not occur if the spreadsheet designers are careful in managing their links.

A useful trick to assure that links data is up-to-date is to include a "**=NOW()**" function in each source workbook, and to link those cells into the destination workbook. That function returns the current time and date, and linking it into the destination will indicate the last time the data from the source was updated in the destination. While it isn't foolproof, it may allow links that have not been updated to be more readily identified.

It's useful to be able to list all of the workbooks that are linked into a particular destination. The Visual Basic program shown in Appendix A will create a new sheet in the current workbook that contains a list of all links found in the current workbook. It displays the same information as the Edit Links command, but embeds it in the workbook to make it easier to review.

Evaluating formulas with the Evaluate Formulas function

This Excel feature is useful to spreadsheet designers as well as reviewers. It's particularly helpful in debugging formulas that contain complex "IF" statements where it's difficult to follow the logic without manually working out each term. The Evaluate Formulas command on the Formulas menu steps through each calculation step displaying the result and then moves on to the next step. In the example below the ROW() function will be evaluated; then the MATCH function, which will provide the arguments to the ADDRESS function, etc.



Displaying formulas

Formulas for individual cells will always be displayed in the formula bar when a cell is selected. But it's often useful to switch the spreadsheet to display ALL of the formulas. This is done with the Show Formulas feature on the Formula Auditing menu. This creates a display that appears like this:

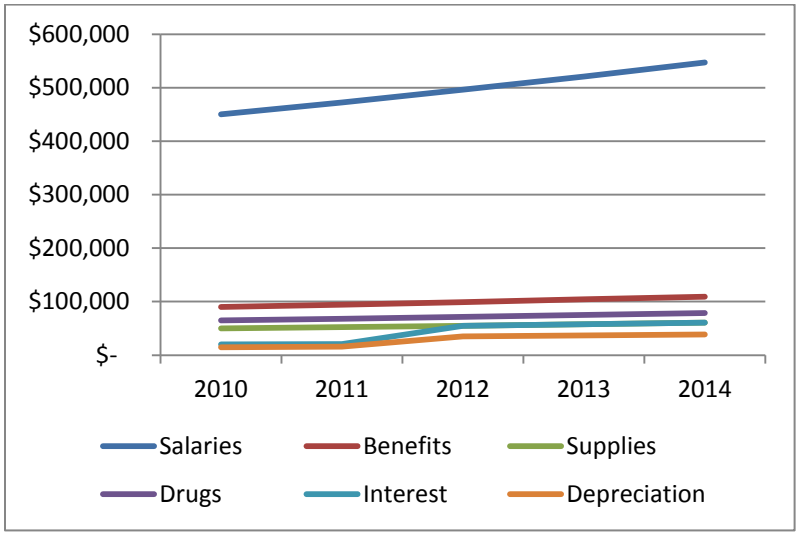
	A	B	C	D	E	F
1		2010	2011	2012	2013	2014
2	Salaries	450000	=B2*(1+$B$11)	=C2*(1+$B$11)	=D2*(1+$B$11)	=E2*(1+$B$11)
3	Benefits	=B2*0.2	=B3*(1+$B$11)	=C3*(1+$B$11)	=D3*(1+$B$11)	=E3*(1+$B$11)
4	Supplies	50000	=B4*(1+$B$11)	=C4*(1+$B$11)	=D4*(1+$B$11)	=E4*(1+$B$11)
5	Drugs	65000	=B5*(1+$B$11)	=C5*(1+$B$11)	=D5*(1+$B$11)	=E5*(1+$B$11)
6	Interest	20000	=B6*(1+$B$11)	55000	=D6*(1+$B$11)	=E6*(1+$B$11)
7	Depreciation	15000	=B7*(1+$B$11)	35000	=D7*(1+$B$11)	=E7*(1+$B$11)

This makes it easy to discern relationships; for example that the benefits expense is derived from the salaries, and that the Interest and Depreciation expenses contain constants in 2012.

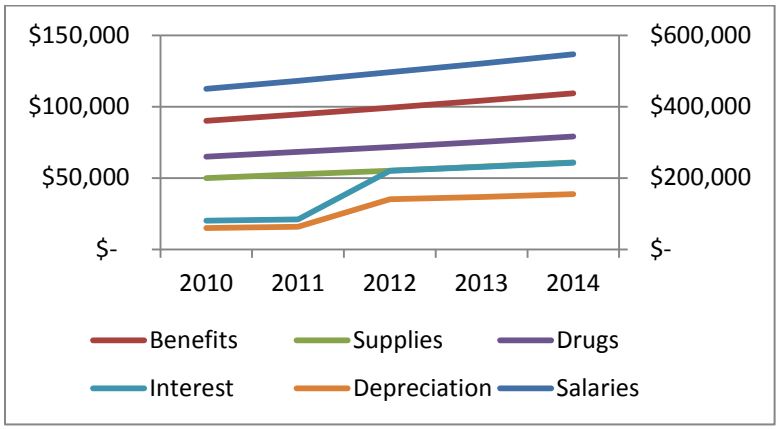
Using conditional formatting and graphs

The Conditional Formatting feature of Excel 2007 will automatically color the background of a group of cells based on their relative values. It's useful for creating a "heatmap" of a large amount of data to identify values that may not match their surrounding values. An example is shown in Appendix B in which low values for Food Service and Housekeeping in 2010 stand out among their surrounding values because of the differences in their background colors.

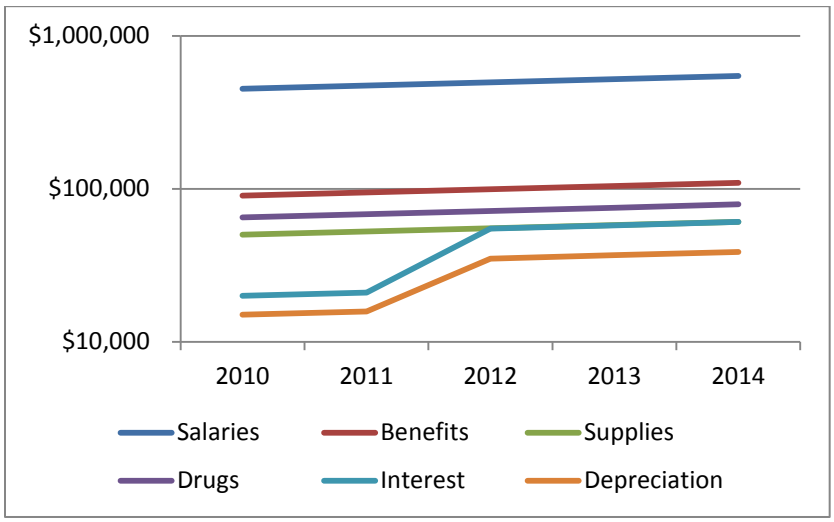
Graphs can also highlight relationships that may not be apparent from tables of data. In the example below, a new piece of equipment will be placed online in 2012, with an associated increase in depreciation and interest expense. Those changes are highlighted in the following graph:



Because salary expenses significantly exceed the other expense, it is helpful to separate them onto the secondary (right) axis:



When amounts of significantly different magnitudes are present, using a logarithmic scale is often helpful to compare rates of change. This compresses the differences between the amounts and allows them to be compared more easily. Note that the left axis is now a logarithmic scale and all of the expense categories can now be displayed on the same axis.



Analytical review

Analytical review is the final step, after the structure of the spreadsheet has been found to be correct. Here's where the remaining logic errors are most likely to be identified. This process requires the reviewer to have a thorough knowledge of the purpose and flow of the model so that various changes to model parameters can be tested to determine if they produce the expected – and correct – outputs.

The process of analytical review will depend on the structure of the particular model, but several general approaches are useful. First, identify the critical assumptions used in the model, determine the effect that they should have on the outputs, and then change the assumptions and verify that the outputs change as expected. For example, changing the rate of inflation should generally

increase expenses commensurately. Similarly, increasing the volume units of a model should increase revenue and expenses, to the extent that those quantities are volume-dependent. Any item for which a dependency can be identified can be tested in this way. A Watch Window is helpful during this process to allow the output of the model to be viewed while changing an input in a different area of the model.

SUMMARY

The inherently unstructured nature of spreadsheets creates a level of flexibility that is extremely helpful when designing models, but also creates significant possibilities for error. Using a structured approach to spreadsheet review, along with the tools that Excel provides to identify these errors, a reviewer has a higher probability of catching these errors.

APPENDIX A

The following Visual Basic for Applications program will create a new sheet that lists all workbooks that are linked to the current Excel workbook;

```
Sub ListLinks()
   Dim aLinks As Variant
   aLinks = ActiveWorkbook.LinkSources(xlExcelLinks)
   If Not IsEmpty(aLinks) Then
      Sheets.Add
      For i = 1 To UBound(aLinks)
         Cells(i, 1).Value = aLinks(i)
      Next i
   End If
End Sub
```

APPENDIX B

Conditional formatting used to indicate inconsistent data in spreadsheet:

Expenses	2008	2009	2010	2011	2012	2013	2014	2015
ICU	$ 2,564,398	$ 2,778,396	$ 3,038,244	$ 2,966,143	$ 3,168,549	$ 3,394,892	$ 3,619,211	$ 3,820,840
Laboratory	$ 2,192,545	$ 2,323,703	$ 2,193,964	$ 2,298,838	$ 2,413,285	$ 2,544,354	$ 2,678,648	$ 2,806,020
Emergency Room	$ 2,106,556	$ 2,323,141	$ 1,886,862	$ 2,226,717	$ 2,287,878	$ 2,351,275	$ 2,417,009	$ 2,485,190
Telemetry	$ 1,863,823	$ 1,999,020	$ 2,062,572	$ 2,161,166	$ 2,268,759	$ 2,391,979	$ 2,518,230	$ 2,637,974
Professional Services	$ 2,109,385	$ 2,141,017	$ 2,119,546	$ 2,220,863	$ 2,331,428	$ 2,458,052	$ 2,587,790	$ 2,710,842
Operating Room	$ 1,901,729	$ 2,081,744	$ 2,061,504	$ 2,214,319	$ 2,311,785	$ 2,424,161	$ 2,540,628	$ 2,652,887
Food Service	$ 1,472,318	$ 1,707,904	$ 608,909	$ 1,893,479	$ 1,950,352	$ 2,012,340	$ 2,075,735	$ 2,137,732
Pharmacy	$ 1,529,875	$ 1,823,034	$ 1,921,243	$ 2,013,080	$ 2,113,302	$ 2,228,078	$ 2,345,678	$ 2,457,217
Nursing A	$ 1,811,581	$ 1,965,696	$ 1,829,682	$ 1,917,143	$ 2,012,588	$ 2,121,895	$ 2,233,890	$ 2,340,114
Nursing B	$ 1,565,369	$ 1,690,117	$ 1,742,732	$ 1,826,037	$ 1,916,946	$ 2,021,058	$ 2,127,731	$ 2,228,907
Nursing C	$ 1,450,445	$ 1,909,048	$ 1,730,633	$ 1,813,359	$ 1,903,637	$ 2,007,026	$ 2,112,959	$ 2,213,432
Nursing D	$ 1,276,519	$ 1,270,618	$ 1,235,513	$ 1,294,572	$ 1,359,022	$ 1,432,833	$ 1,508,459	$ 1,580,188
Cardiac Cath	$ 1,168,589	$ 1,320,504	$ 1,231,619	$ 1,290,492	$ 1,354,739	$ 1,428,317	$ 1,503,705	$ 1,575,207
Housekeeping	$ 1,133,542	$ 1,236,119	$ 397,199	$ 1,235,140	$ 1,272,239	$ 1,312,675	$ 1,354,028	$ 1,394,469
Radiology	$ 1,008,613	$ 1,053,231	$ 1,006,837	$ 1,054,965	$ 1,107,486	$ 1,167,635	$ 1,229,264	$ 1,287,717
Physical Medicine	$ 900,021	$ 910,078	$ 1,378,550	$ 1,375,430	$ 1,438,057	$ 1,510,599	$ 1,585,888	$ 1,658,430
Medical Records	$ 917,512	$ 926,571	$ 312,996	$ 973,299	$ 1,002,533	$ 1,034,397	$ 1,066,984	$ 1,098,852
Admissions	$ 692,147	$ 733,089	$ 904,761	$ 1,154,028	$ 1,195,239	$ 1,240,045	$ 1,287,338	$ 1,333,504
Maintenance	$ 711,049	$ 760,851	$ -	$ 759,223	$ 774,407	$ 789,895	$ 805,693	$ 821,807
Respiratory	$ 642,125	$ 677,357	$ 737,049	$ 772,281	$ 810,729	$ 854,761	$ 899,876	$ 942,666
Nursing Administration	$ 633,549	$ 667,899	$ -	$ 714,044	$ 728,325	$ 742,891	$ 757,749	$ 772,904
Central Supply	$ 646,628	$ 669,644	$ 210,088	$ 671,086	$ 689,927	$ 710,466	$ 731,604	$ 752,498
Case Management	$ 570,413	$ 562,371	$ -	$ 588,416	$ 600,184	$ 612,188	$ 624,432	$ 636,921
Recovery Room	$ 521,016	$ 545,477	$ 539,445	$ 579,433	$ 604,938	$ 634,344	$ 664,821	$ 694,196
Pediatrics	$ 566,131	$ 552,736	$ 540,933	$ 566,790	$ 595,008	$ 627,323	$ 660,434	$ 691,838
Overhead	$ 438,599	$ 415,283	$ -	$ 550,733	$ 561,747	$ 572,982	$ 584,442	$ 596,131
Short Procedure	$ 454,227	$ 489,351	$ 520,788	$ 545,682	$ 572,849	$ 603,961	$ 635,839	$ 666,074
Cardiac Rehab	$ 464,366	$ 474,946	$ 487,097	$ 510,381	$ 535,790	$ 564,890	$ 594,705	$ 622,984
Transporters	$ 340,973	$ 393,511	$ 407,008	$ 426,463	$ 447,695	$ 472,010	$ 496,923	$ 520,552
CAT Scan	$ 398,388	$ 404,616	$ 408,590	$ 428,121	$ 449,435	$ 473,844	$ 498,854	$ 522,575
Medical Affairs	$ 283,848	$ 264,812	$ -	$ 348,926	$ 355,904	$ 363,022	$ 370,283	$ 377,688
Medical Records/Transcription	$ 353,389	$ 359,888	$ 115,815	$ 360,140	$ 370,957	$ 382,748	$ 394,805	$ 406,597
Radiation Oncology	$ 383,367	$ 385,248	$ 333,684	$ 349,634	$ 367,041	$ 386,975	$ 407,400	$ 426,773
Operation of Plant	$ 256,670	$ 271,272	$ -	$ 293,862	$ 299,739	$ 305,734	$ 311,849	$ 318,086
Security & Safety	$ 279,905	$ 287,065	$ -	$ 286,906	$ 292,644	$ 298,497	$ 304,467	$ 310,556
Pre-Admissions Testing	$ 250,872	$ 268,439	$ 262,452	$ 274,997	$ 288,688	$ 304,367	$ 320,432	$ 335,669
Nuclear Medicine	$ 312,068	$ 252,767	$ 257,011	$ 269,297	$ 282,704	$ 298,058	$ 313,789	$ 328,710
Gastro Lab	$ 234,082	$ 266,358	$ 252,931	$ 265,021	$ 278,215	$ 293,326	$ 308,808	$ 323,492
Ultrasound	$ 225,913	$ 237,695	$ 254,425	$ 266,587	$ 279,859	$ 295,058	$ 310,632	$ 325,403
Utilization Review	$ 168,615	$ 215,992	$ -	$ 259,796	$ 264,992	$ 270,292	$ 275,698	$ 281,212
Storeroom	$ 199,179	$ 218,650	$ -	$ 258,895	$ 264,073	$ 269,355	$ 274,742	$ 280,237
Special Procedures	$ 222,515	$ 216,893	$ 212,370	$ 222,522	$ 233,600	$ 246,287	$ 259,287	$ 271,616
Anesthesia	$ 819,405	$ 685,617	$ 201,061	$ 215,966	$ 225,472	$ 236,432	$ 247,791	$ 258,740
MRI	$ 183,467	$ 190,429	$ 190,717	$ 199,833	$ 209,782	$ 221,175	$ 232,849	$ 243,922
Remote Telemetry	$ 160,033	$ 191,978	$ 176,913	$ 185,370	$ 194,599	$ 205,168	$ 215,997	$ 226,267
Pulmonary	$ 170,807	$ 171,049	$ 171,535	$ 179,734	$ 188,682	$ 198,930	$ 209,430	$ 219,388
Switchboard	$ 204,350	$ 197,929	$ -	$ 191,259	$ 195,084	$ 198,986	$ 202,966	$ 207,025
Chemotherapy	$ 150,201	$ 169,270	$ 165,101	$ 172,993	$ 181,606	$ 191,469	$ 201,575	$ 211,160
Blood Bank	$ 169,376	$ 125,366	$ -	$ 108,544	$ 110,715	$ 112,929	$ 115,187	$ 117,491
Educational Services	$ 131,467	$ 144,911	$ -	$ 138,519	$ 141,289	$ 144,115	$ 146,997	$ 149,937
Mammography	$ 117,594	$ 117,754	$ 166,434	$ 166,057	$ 173,618	$ 182,376	$ 191,466	$ 200,224
Pastoral Care	$ 103,347	$ 108,770	$ -	$ 111,622	$ 113,854	$ 116,131	$ 118,454	$ 120,823
Risk Management	$ 121,167	$ 111,920	$ -	$ 96,480	$ 98,410	$ 100,378	$ 102,386	$ 104,433
Laundry	$ 86,957	$ 89,045	$ 24,500	$ 76,187	$ 78,475	$ 80,970	$ 83,520	$ 86,015
Infection Control	$ 59,712	$ 64,708	$ 21,531	$ 66,954	$ 68,965	$ 71,157	$ 73,398	$ 75,590
Oncological Services	$ 65,437	$ 64,100	$ 63,999	$ 67,059	$ 70,397	$ 74,220	$ 78,138	$ 81,853
EEG	$ 52,585	$ 52,473	$ 51,455	$ 53,914	$ 56,598	$ 59,672	$ 62,822	$ 65,809
Administration	$ 415,764	$ (26,613)	$ -	$ 33,352	$ 34,019	$ 34,699	$ 35,393	$ 36,101
Gift Shop	$ -	$ -	$ -	$ 35,772	$ 36,488	$ 37,218	$ 37,962	$ 38,721
Volunteers	$ 24,023	$ 24,862	$ -	$ 25,731	$ 26,245	$ 26,770	$ 27,306	$ 27,852
O/P Peds-Immunization Clinic	$ 22,870	$ 27,540	$ 19,297	$ 20,219	$ 21,226	$ 22,379	$ 23,560	$ 24,680
Medical Education	$ 3,156	$ 3,479	$ -	$ 19,549	$ 19,940	$ 20,339	$ 20,745	$ 21,160
Diabetes Medical Mgt Clinic	$ 39,404	$ 35,161	$ -	$ 4,592	$ 4,684	$ 4,777	$ 4,873	$ 4,970
CICU	$ 182	$ -	$ -	$ 309	$ 316	$ 322	$ 328	$ 335
Nursing E	$ 23,542	$ 1,429	$ 692	$ 725	$ 761	$ 803	$ 845	$ 885
Nursing F	$ -	$ -	$ 688	$ 721	$ 757	$ 798	$ 840	$ 880
Obstetrics	$ 114,006	$ 13,027	$ -	$ 4	$ 4	$ 4	$ 4	$ 4
MICU	$ -	$ 1,539	$ -	$ -	$ -	$ -	$ -	$ -
Public Relations	$ 731	$ -	$ -	$ -	$ -	$ -	$ -	$ -

ABOUT SINGLETRACK ANALYTICS

Singletrack Analytics assists healthcare providers and purchasers utilize their financial and clinical data to achieve their strategic goals. We have worked with hospitals, integrated delivery systems, payers and others to model payment systems and design data warehouses, reporting solutions, and financial analyses. We understand the healthcare financial environment and the tools and techniques required to achieve success.

For information about Singletrack Analytics, please visit our website at www.singletrackanalytics.com, or email at info@singletrackanalytics.com.