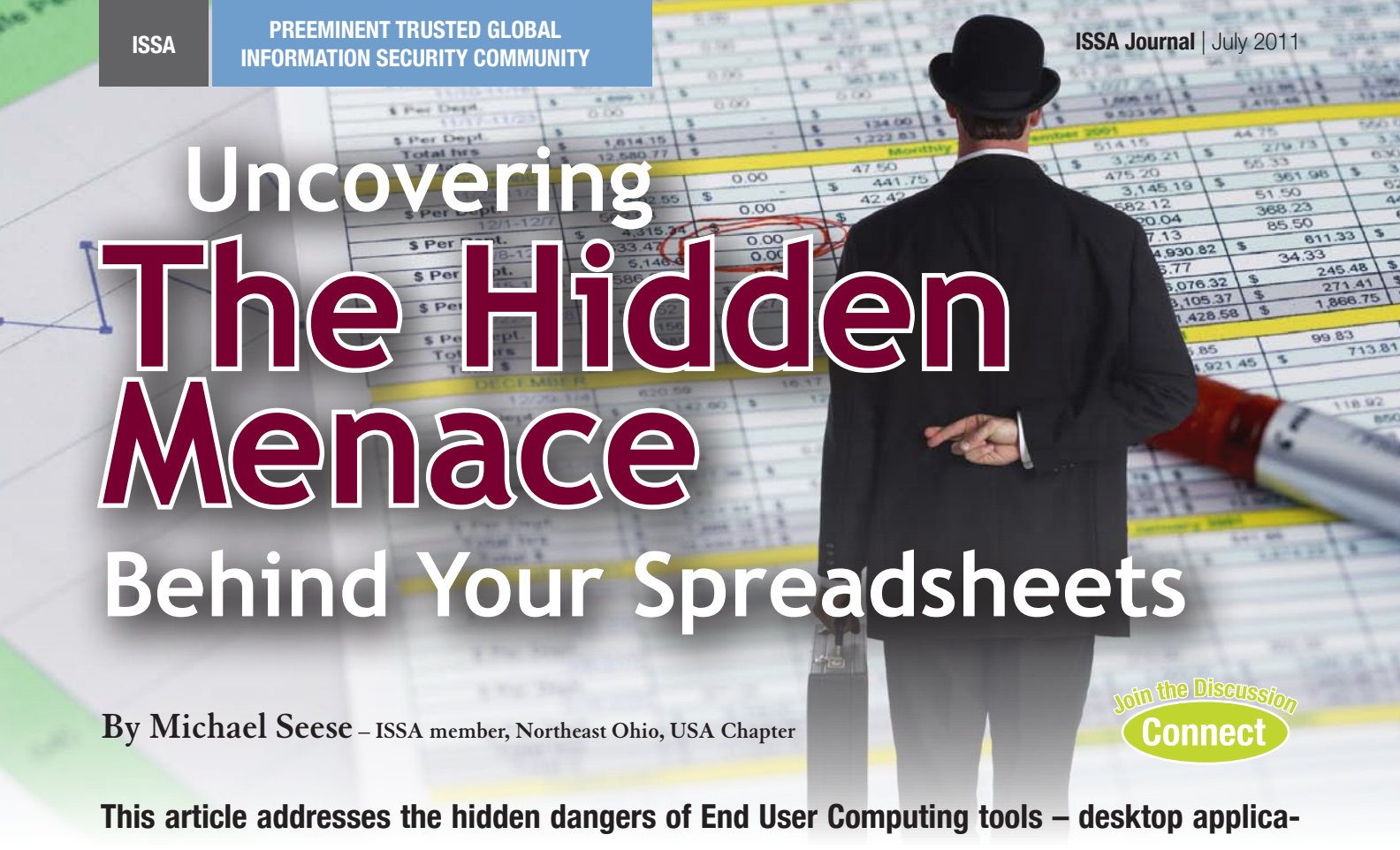

Uncovering The Hidden Menace Behind Your Spreadsheets

By Michael Seese – ISSA member, Northeast Ohio, USA Chapter

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This article addresses the hidden dangers of End User Computing tools – desktop applications, typically spreadsheets and databases, that perform various departmental functions – and describes methods of managing them.

EUC. If you have not yet encountered this particular three-letter acronym, you probably will in the near future. End User Computing tools are desktop applications – typically spreadsheets and databases – that perform various departmental functions in organizations everywhere.

The hidden danger of EUC applications is a kind of scope creep. We've all heard the term *scope creep* as it relates to projects. The same fate can befall a simple tool used by an employee. Leo creates a spreadsheet to run some month-end numbers. He quits and Sacha inherits it, adding some nested if statements. She is promoted, and bequeaths it to Britt, who creates some macros, despite a complete lack of programming experience. In time, this "Franken-app" has ballooned, both in complexity and importance. Then Sacha, the manager, remembers this handy little tool she once used and reclaims it for her own year-end reporting.

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Suddenly, this once simple spreadsheet – created by one person to help him do his job – is now providing the figures which go to the general ledger, and then on to the formal documents provided to regulators and "The Street."

But what happens if the formula `=SUM(A1:A20)`, after being copied across columns for the *nth* time, becomes `=SUM(Z1:Z19)`?

What happens if a derived cell is populated with an absolute reference, rather than a relative reference, therefore pulling a value from the wrong place?

What happens if the macro contains a simple logic error which reports 0 when it should have been 1?

What happens if Sacha realizes she can skim a few dollars off the books by hiding an entire row or simply a single value with the old white-text-on-a-white-background trick?

The above scenarios may be "generic," but consider these real-world examples:

- An Irish drink manufacturer saw its share value drop 15% after reporting that revenues had not increased, but rather had dropped 5%. The error occurred when data was transferred from an internal-use spreadsheet to another used to produce the earnings report.[1]

1 http://drinksdaily.com/2009/07/cc-group-admit-to-mistake-in-revenue-results.

- The city of Lewiston, Maine, had to postpone a bond offering because the advertised value was $1.2 million less than the actual total package. According to City Clerk Kathy Montejo, "The list itself was accurate and all of the dollar amounts for all the projects were correct. Unfortunately there was a calculation error in the spreadsheet. The grand total at the bottom wasn't accurate."[2]
- Scott Hirth, the former vice president of finance and CFO of the information and learning division of ProQuest, used hidden rows and white-on-white to cover up his fraudulent accounting practices which enabled him to inflate the company's reported pre-tax earnings over a four-year period. When the scheme unraveled, ProQuest saw its share price drop from $29.41 to $12.31; today it trades on the Pink Sheets.[3]
- Finally, consider that it has been widely reported that Bernie Madoff and Jerome Kerviel (who is alleged to have cost French bank Societe Generale $7.2 billion) used spreadsheets to hide their exploits.

If you are still not convinced, consider the European Spreadsheet Risks Interest Group, a consortium of academics, researchers, and professionals who offer "the world's only independent, authoritative and comprehensive web-based information describing the current state of the art in Spreadsheet Risk Management." [4]

Handling the hidden menace

So how does an organization combat this hidden menace? Not surprisingly, the answer is "it depends." It depends on the size of your organization, your use of and reliance on EUC applications, and your budget.

There are a number of commercial applications available to discover, analyze, and monitor your EUC tools. I will not name any names. Suffice to say, searching "EUC discovery tool" will find you plenty. (In the interest of full disclosure, as I write this article, I am part of a team that has been reviewing several commercial solutions for my employer.)

But if you do not have the funds – or you believe the problem is tractable – I can suggest a number of common-sense practices you can use to safeguard and review your spreadsheets.

A good first step is access control. Working on the assumption that you are using Microsoft Excel, under *Tools/Protection* are several options (Figure 1).

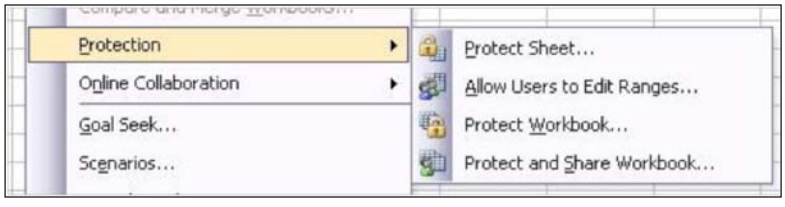

Figure 1

I will not bore you with the minutiae of implementing one of these options. But, if you password-protect an entire workbook (allowing read-only access to the masses) or even specific cells, you will at least reduce the number of people who can make intentional or inadvertent alterations.

Another easy tactic is to unhide and review all rows and columns. If you click on the upper-left corner box (Figure 2) you will select all the cells in the sheet.

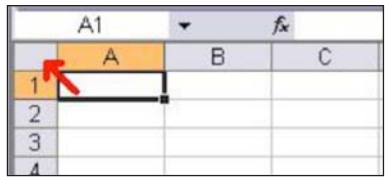

Figure 2

Then choose *Format/Row/Unhide* and *Format/Column/Unhide* to reveal any hidden cells. It might help to take a screen shot as a first step to make any hidden rows or columns stand out. Of course if you look carefully at the row numbers or column letters, it is not too hard to see hidden elements as you will notice, for example, row 13 followed by row 15. But in a large spreadsheet those subtleties can be easy to miss. Bear in mind, there are a number of legitimate reasons to hide data elements. But looking for and reviewing them still makes sense.

Along those lines, it is possible to hide entire worksheets, and to *very* hide worksheets. To unhide a worksheet, click on *Format/Sheet/Unhide*, which will reveal any worksheets hidden the *standard* way.

Figure 3

Very hidden worksheets are a little more complex. To very hide a worksheet, click on *Tools/Macro/Visual Basic Editor*. At the top of the left pane are the worksheets, listed as "Microsoft Excel Objects." These objects have properties, and the last property is *Visible*. As you can partly see from the image, the option which begins "2-" is SheetVeryHidden (Figure 3).

If a worksheet is very hidden, *Format/Sheet/Unhide* will not find it. In order to uncover a very hidden sheet, you would have to open the VB Editor, and one-by-one look at the Visible property of each object.

Another obfuscation trick is entering a value (for example, in the middle of a group of numbers to be summed) and then changing its text color to match the background, most likely, white on white. Like hidden rows, columns, and worksheets, there may be a legitimate reason to hide the value in a single cell through this method…though I cannot think of one. To me, this technique seems to serve only to hide something nefarious. To uncover, select all of the cells in the workbook and

2 http://www.sunjournal.com/city/story/1040725.

3 http://www.cfo.com/article.cfm/11779964/c_11778073?f=TodayInFinance_Inside.

4 http://www.eusprig.org.

change the text color to black. As suggested above, it may help to take a *before* screen shot for comparison purposes.

Those are some of the basic methods you can use to protect and check your worksheets. Others, though not much more challenging to implement, are less widely known. Some of the more common trouble zones include inconsistent formulas and linked cells.

Formula auditing

The tools to check for these issues are available on the *Formula Auditing* toolbar (Figure 4).

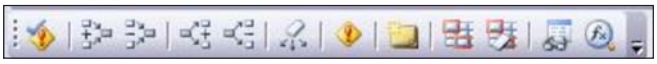

Figure 4

If you hover over the icons, they are (left to right) *Error Checking, Trace Precedents, Remove Precedent Arrows, Trace Dependents, Remove Dependent Arrows, Remove All Arrows, Trace Error, New Comment, Circle Invalid Data, Clear Validation Circles, Show Watch Window,* and *Evaluate Formula.* These checks will help you uncover some of the more common problems associated with complex spreadsheets.

Inconsistent formulas

As mentioned above, if a formula is copied across the sheet multiple times, it is possible that it will lose a cell along the way, resulting in a summation of nine values instead of ten. Another common error (which I myself have committed) can arise when adding rows. If, for example, the cells in row 11 are a sum of rows 1 – 10, and you add a row between 10 and 11, the formula (now residing in row 12) does not include values from row 11.

With or without the Formula Auditing toolbar being visible, if Excel finds a formula cell which is unlike those around it, the program will put a little green arrow in upper-left corner of the suspect cell (Figure 5).

	A	B	C	D	E
1	Q1	1	2	3	4
2	Q2	1	2	3	4
3	Q3	1	2	3	4
4	Q4	1	2	3	4
5	Total	4	8	9	16

Figure 5

If you click on the offending cell, a little exclamation box will appear. Hovering over the box will reveal the error message, as will clicking on the drop-down arrow (Figure 6).

	A	B	C	D	E	F	G	H	I
1	Q1	1	2	3	4				
2	Q2	1	2	3	4				
3	Q3	1	2	3	4				
4	Q4	1	2	3	4				
5	Total	4		9	16				
6									
7			The formula in this cell differs from the formulas in this area of the spreadsheet.						

Figure 6

If you then click in the formula bar, you will see the inconsistent formula is highlighted (Figure 7).

SUM =SUM(D1:D3)

	A	B	C	D	E
1	Q1	1	2	3	4
2	Q2	1	2	3	4
3	Q3	1	2	3	4
4	Q4	1	2	3	4
5	Total	4	8	M(D1:D3)	16

Figure 7

If you do click on the drop-down arrow, one of the choices is the *Error Checking Options* box. Here you can select what Excel reports as an error. By default (at least on my system) all were checked except for "Formulas referring to empty cells." As the name suggests, this check looks to see if a multi-cell formula includes any cells which are blank. I do not consider this potential source of error to be a great concern. If you have a long block of cells to total, you might intentionally add blank rows for clarity. Likewise, if you have a huge grid that is full of numbers, a lone empty cell will stand out. Still, there may be times you will want to flip this on, at least for reviewing purposes.

In some cases, the formula is not so subtly wrong. We have probably all seen the familiar Excel error messages: *#REF!* error, *#DIV/0!* error, and *#NUM!* error, to name a few. Suffice to say, if you encounter one of these, you'll need to investigate.

Links

Links – either to other cells on a single worksheet, to other worksheets in a single workbook, or to other workbooks – can get broken. If you click on either the Trace Precedents or Trace Dependents button, Excel will draw an arrow pointing one way or the other, depending on which one you chose. If your formula is simply a summation at the bottom of a column of numbers, what you see will not appear to be that much different from the inconsistent formula image, above. But if a cell depends on another that is "far away," this check really helps (Figure 8).

	D	E	F	G	H	I
51	$1,031	$0	$0	$50,000	$1,500	$0
52						
53						
54						
55						
56						$52,531
57						

Figure 8

Though it is harder to see, in this image the thin blue line also goes straight down to cell D122 and across to cell V51.

And if a cell depends on a value that appears on another worksheet, you will see a black dashed line pointing to a little "grid" symbol.

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The Circle Invalid Data check is used in conjunction with data validation rules which, not surprisingly, are available on the menu under *Data/Validation*. If you set a validation rule – for example, requiring that values in a range of cells be between 1 and 10 – and then try to enter a number that is outside of that range, you will get a pop-up box which informs you of the error and actually prevents you from inputting that value. But if you impose a data validation rule on a series of cells which already have values – and one is outside of the allowed range – Excel will not warn you. Clicking on Circle Invalid Data will draw red circle around such unacceptable numbers.

The Evaluate Formula button does not offer much when used on a simple formula, such as a sum of a single column of values. But it does help when evaluating a nested formula by allowing you to step through it and examine components of the formula, and the value returned at each stage.

Conclusion

Certainly, there are a number of other elements that the commercial applications can look for: formulas with constants, cells with rounding errors, formulas with absolute cell references, numbers stored as text, and formulas which include cells that have text rather than numbers, to name a few. But in most cases, the formatting and formula review tips I suggest above will uncover a high percentage of common mistakes.

As a final bit of advice, you might want to consider, at minimum, moving your truly mission-critical EUC applications into an access-controlled central repository (such as SharePoint), and perhaps having them become applications managed by your IS group.

About the Author

Michael Seese, CISSP, CIPP, is an information security, privacy, and business contingency professional in Chagrin Falls, Ohio. He holds a Master of Science in information security, and a Master of Arts in psychology. Michael regularly speaks at conferences, has had numerous articles published in professional journals, and contributed two chapters to the 2008 PSI Handbook of Business Security. *He is the co-author of* Haunting Valley, *a compilation of ghost stories from the Chagrin Valley. Michael also penned the twin books* Scrappy Information Security *and* Scrappy Business Contingency Planning. *He may be reached at scrappy@MichaelSeese.com.*