Spreadsheet Risk

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Introduction

Since its introduction in the 1980's, spreadsheet software has provided analysts and planners with a complex and valuable tool permitting the timely modeling of financial systems and organizational problems. Through the use of macros, linking, and complex formulas, a spreadsheet user is capable of collecting, organizing and analyzing data without involving anyone with a background in data organization and storage, and can do this work outside of the rigidly controlled environment in which formal software is developed. While this capability allows an organization to be nimble and quickly respond to new trends and data collection, there is an awakening to the risk inherent in the current business dependency on spreadsheets.

With the passage of the Sarbanes-Oxley Act in 2002, attention was drawn to spreadsheets because of the requirements of Section 404. This section requires management and external auditors to report on the adequacy of a company's internal control over financial reporting. Because of the power and flexibility of the modern spreadsheet, many organizations use spreadsheets to determine financial transaction amounts or balances which are then populated into the general ledger and/or financial statements. This type of spreadsheet use, as opposed to performing analysis or monitoring operational activities, is what converts the spreadsheet into a form of financial reporting, and in turn invokes the need to have internal controls for spreadsheets per the Sarbanes-Oxley requirements.

As more attention is focused on the use of spreadsheets to drive financial reporting, the question must be asked, "How accurate are the spreadsheets?" Professionally developed software performing financial functions validates the inputted data, is tested with a variety of scenarios, and uses verified algorithms. Spreadsheets, on the other hand, are often developed to meet an immediate need, have little or no validation of data inputs, rarely undergo formal testing and, as a general rule, are continually evolving over time. Unfortunately, these negatives associated with spreadsheets are also what makes them attractive to organizations: developing a spreadsheet does not require involvement of information technology or data processing professionals; a spreadsheet can be developed quickly and efficiently to meet an immediate need; a spreadsheet can be easily modified, or copied and modified to quickly respond to the needs of management.

> *"The error occurred when the accountant omitted the minus sign on a net capital loss of $1.3 billion and incorrectly treated it as a net capital gain on this separate spreadsheet. This meant that the dividend estimate spreadsheet was off by $2.6 billion.... "*

Spreadsheet Horror Stories

When examining the consequences of spreadsheet errors, much of the evidence is anecdotal and illustrated in news stories which draw attention when the errors are large enough to cause embarrassment or significant financial impact on an organization. The European Spreadsheet Risk Interest Group (EuSpRiG, www.eusprig.org) maintains a "horror stories" link on the group's home page with a number of these

incidents. One of the most costly of these stories depicts a 1995 incident with the Fidelity Magellan Fund where a $1.3 billion amount was entered in a spreadsheet without a minus sign, indicating a net capital gain had occurred versus a net capital loss [1]. Numerous shareholders, expecting a large dividend payout, found themselves receiving nothing. More recently, a British medical school allowed four students to graduate and begin practicing medicine because of a spreadsheet error made when cutting and pasting data. The error was discovered when a fifth student who had received a failing grade appealed, and was determined to have passed the final exam, while the other four were determined to have failed the final exam.

Spreadsheet Risk Research

The academic research into spreadsheet errors is limited, but it is clear that a large number of spreadsheets contain errors. Professor Raymond R. Panko of the University of Hawaii is the most published of the spreadsheet researchers. In a 2008 version of his paper, "What We Know About Spreadsheet Errors," he reports on field audits of spreadsheets. Of the 113 spreadsheets covered in the field audits, 88% of them contained errors. When the data was broken down into an error rate per cell, it becomes clear that approximately one of every 100 spreadsheet non-label cells created contains an error. [3]

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Panko also summarized the efforts of some researchers to determine how many spreadsheets developed from scratch in laboratory experiments contain errors. In these controlled environments, spreadsheet developers that range from novice to experienced are given a word problem to solve with a spreadsheet. The results were similar to those in the field audits, with a range of 55% to 63% of spreadsheets having errors. Interestingly enough, in these exercises, the cell error rate ranged from 4.3% to 21% of all cells containing errors. [3]

If spreadsheets contain errors, certainly a good spreadsheet developer should be able to find those errors and correct them. Interestingly enough, there is also research in this area. In studies where individual subjects were given spreadsheets that contained errors, only between 55% and 65% of the errors were found. These tests used both inexperienced and expert users. Further studies found that when the review was conducted by groups of three spreadsheet users, the error recognition rate increased to only 83%. [3]

With organizations being charged, both ethically and legally, with controlling their financial reporting, the above information is concerning. Few, if any, organizations control spreadsheet development in the way that software application development is controlled. Most organizations that rely on spreadsheets have any design, development and production use controls placed on spreadsheets. It is very rare to have spreadsheet development undergo a peer review be documented and discussed before development begins, or have any stringent criteria applied to spreadsheets. Furthermore, spreadsheets often proliferate through an organization, as existing

spreadsheets are used to model future spreadsheets because of their functional similarity or style issues.

Assessing Spreadsheet Risk

One of the first issues that can be addressed by any organization is assessing its current exposure to spreadsheet risk. Researchers at the Tuck School of Business at Dartmouth College have put together a five question risk assessment that can quickly let an organization know its exposure to spreadsheet risk [4].

1. How important are spreadsheets in your organization?
   - Not all important (1)
   - Somewhat important (2)
   - Important (3)
   - Very important (4)

2. What is the size of the spreadsheet models generally created?
   - Under 100 cells (1)
   - 101 to 1,000 cells (2)
   - 1,001 to 10,000 cells (3)
   - 10,001 to 100,000 cells (4)
   - Over 100,000 cells (5)

3. How many other users are there for a typical spreadsheet?
   - None (1)
   - 1 other person (2)
   - 2-5 other people (3)
   - 6-10 other people (4)
   - More than 10 other people (5)

4. How often is a spreadsheet used after it is developed?
   - Annually (1)
   - Quarterly (2)
   - Monthly (3)
   - Once or twice per week (4)
   - Daily (5)

5. What are spreadsheets used for in your organization? (Check all that apply)
   - Analyzing data (e.g. financial, operational) (1)
   - Determining trends and making projections (1)
   - Statistical analysis (1)
   - Optimization (e.g. Solver, *What's Best*) (1)
   - Simulation (e.g. *Crystal Ball, @Risk)* (1)

Total Score:_____

CATEGORIES OF RISK
12 or below = **Low Risk**; 13-16 = **Medium Risk**; 17 or above = **High Risk**

Conclusions

If an organization desires to continue to use spreadsheets to drive financial reporting, there are a number of steps that can be taken to reduce the associated risk. The first is for an organization to begin treating spreadsheet development for what it truly is, more of a software development project than a quick and dirty desk-top calculator which just happens to have some neat features. Among these risk reducers are steps like:

- Implement change control procedures for all spreadsheets
- Create design procedures and processes which validate the problem the spreadsheets are created to solve.
- Develop standards for cell naming, and formula creation that improve the validation of spreadsheet models by visual inspection.
- Implement peer a peer review process by which new spreadsheet models are reviewed and validated before being used for financial reporting.

Another approach is to try and reduce the need for spreadsheets by employing information systems that are targeted to solve specific problems. For example ERP solutions can meet a number of financial reporting requirements. In addition, there are complimentary off the shelf solutions that help solve property management, revenue management and project management. Where available, these solutions significantly reduce the risk to an organization by providing tested and validated algorithms that cannot be modified by the user. In addition, most modern information systems provide data input validation and checking to ensure that identification codes match, and that erroneous data is not input to the system. In closing, when an organization finds that a business function is overly reliant on spreadsheets, they should either begin to treat spreadsheet models as software development projects, or seek out commercial off the shelf software products to meet the financial reporting needs.

References

[1] The Risk Digest, Vol 16, Issue 72, 2/6/95
[2] General Medical Council: Cardiff Medical School Examination Errors, 10/28/2009
[3] What We Know About Spreadsheet Errors, 2008, Raymond R. Panko, University of Hawaii
[4] Spreadsheet Risk, Awareness, and Control, 2009, Kenneth R. Baker, Lynn Foster-Johnson, Barry Lawson, and Stephen G. Powell, Spreadsheet Engineering Research Project Tuck School of Business Dartmouth College