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Spreadsheet Management

Not what you figured



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Given the ubiquity of electronic spreadsheets in the workplace, you may not realize that 2008 is only the 30th anniversary of the launch of VisiCalc, the precursor to all modern electronic spreadsheet applications. And Excel, Microsoft's spreadsheet program, has been widely available for only 20 years. Prior to 1978, electronic spreadsheet programs ran on mainframe behemoths beyond the reach of any user except giant manufacturers, banks, and investment firms.

Today, however, spreadsheet applications underlie countless business functions, from calculating accounting estimates, tracking workflow processes, to key financial reporting. At the executive level, spreadsheets can offer an instant, concise corporate snapshot that often drives critical decisions with major implications to the big picture. Excel and other spreadsheet programs reside on over 90% of computer desktops globally. While that represents an impressive accomplishment for software developers, it should jangle the nerves of executives. Why? Because every user who accesses a spreadsheet represents a potential risk to the integrity of the data it contains.

Spreadsheets are applications, just as every other electronic tool in the business arsenal, and as such, their underlying structure and code are largely unknown to all except the most sophisticated user. With spreadsheets, all users are simultaneously owner, developer, programmer, tester, and user. Programmers are trained in structural analysis and programming methods — most spreadsheet users are not. Most applications have application level-security — spreadsheets frequently do not. With no intrinsic audit trail, spreadsheets can change every time they are opened. And spreadsheet applications can contain internal errors

that can affect formulas. (For example, most users are probably unaware that Excel treats the year 1900 as a leap year, even though it was not.) Since January 2008 alone, Microsoft has issued "fixes" for 10 identified Excel flaws, five of which were labeled "critical."¹

Of course, software developer errors and other quirks (such as, say, the Y2K bug) pale in comparison to end-user problems, such as entry errors, misuse, and fraud.

In sum, spreadsheet applications can be an incubator for compounding issues leading to an avalanche of misinformation.

Spreadsheets: Balancing convenience and risk

On February 28, 2008, Deloitte convened a Dbriefs webcast: Spreadsheets: Balancing Convenience and Risk.

Following the webcast, viewers were polled on their levels of awareness and concern about spreadsheet security and management. Almost 3,000 responses were tallied.

Selected polling results will be shared in the appropriate sections of this whitepaper.

¹ http://www.informationweek.com/story/showArticle.jhtml?articleID=196901868&cid=RSSfeed_IWK_Security

Overview

The primary advantages of spreadsheets — namely their ostensible simplicity and the ability to share and freely modify the files — also pose the greatest risks. Spreadsheets are standalone files and therefore practically devoid of system-wide controls. Almost any employee can create, access, manipulate, and distribute spreadsheet data. As a result, almost any employee can make a critical error while manually entering data or configuring formulas.

There is, however, a Risk Intelligent approach to the management of spreadsheets that can substantially mitigate systemic and application flaws, both human and electronic. Installation of effective, auditable controls surrounding critical spreadsheets and their use can have a direct impact on financial reporting and compliance. A carefully structured approach to managing spreadsheets can help protect critical spreadsheets. Implementing a controlled environment can be achieved, albeit with challenges, which can be more clearly identified in addressing the following questions:

- How many versions of a given spreadsheet are out there? Who else is modifying this spreadsheet? Which is the correct or most-recent version?
- Who can see or modify data in the spreadsheet? Should they have this level of access?
- Are the formulas and calculations in the spreadsheet accurate?
- Is there documentation of the way this spreadsheet processes data?
- How does one ensure that unauthorized users cannot manually override spreadsheet functionality?
- What built-in audit function tracks changes and restricts authority to make changes to this spreadsheet?
- How is the current version of this spreadsheet backed up?

Responses to these challenges are not theoretical exercises. Among “real-life” spreadsheet horror stories, a utility company found, at the last minute, that in a lengthy spreadsheet formula, parentheses were out of place — projected gains fell from \$200 million to \$25 million. In another instance, executives of a healthcare service provider admitted to preparing a false spreadsheet for auditors that inflated assets, thus falsifying the company’s worth — earnings were overstated by at least \$3.5 billion.



Identifying and risk-ranking the spreadsheet population

To help organizations enhance the management of their spreadsheet environment — and avoid situations ranging from embarrassing or inconvenient to crippling or criminal — management, whether through internal auditors, compliance teams, information systems, or a risk management group, should incorporate the following six steps as part of ongoing audit activities:

1. Identify the population of spreadsheets for review
2. Create a spreadsheet inventory
3. Rank each spreadsheet’s risk level
4. Develop a baseline for each spreadsheet
5. Evaluate policies and procedures for spreadsheet use
6. Review controls that protect spreadsheet baselines

The chart below outlines these steps graphically. A more complete discussion follows.

Does your company factor spreadsheet risk into your overall risk reporting and decision-making process?	
Votes received:	2,908
Spreadsheets are considered as a part of my company’s periodic risk assessment	41.9 %
Spreadsheets are not considered as a part of my company’s periodic risk assessment	29.3 %
My company does not formally assess risks on a periodic basis	11.3 %
Don’t know/Not applicable	17.5 %

Step chart for management



1. Identify the population of spreadsheets for review

The first step of any spreadsheet management project involves identifying the population of spreadsheets to be included in the review. Depending on the purpose of the review as determined by the associated spreadsheet risks, different identification techniques can be used:

Interviews: Simply asking process owners what spreadsheets they use is probably the easiest and quickest way to establish a population. On the other hand, because of their informal nature, interviews also have the greatest chance of producing an incomplete spreadsheet inventory list.

Walkthroughs: Create a flowchart or narrative of a business process and note when a spreadsheet is used. This is especially helpful when testing spreadsheets during compliance audits with the Sarbanes-Oxley Act of 2002 and other similar legislation, as the auditor is often required to make assessments at the process level. Although this method is more time-consuming than conducting interviews, the risk of failing to identify mission-critical spreadsheets is reduced even if not completely eliminated.

Tools: Auditors can employ commercially available or internally developed tools designed to scan network resources and return a list of all spreadsheets used in the organization. Providing that all relevant resources are scanned, this technique will result in the most complete spreadsheet population list possible. It should be noted, however, that storage devices that are routinely disconnected from the network — such as USB drives, CDs, and even laptops — may hinder a thorough accounting. Also, sorting the results of such a comprehensive inventory might demand significant resources, making this technique impractical in some circumstances.

Poor diagnosis for spreadsheets in health care?

Spreadsheet management has captured the attention of many executives and organizations, particularly in finance, taxation, and regulatory compliance. Might there be a reason to be concerned that a similar level of awareness may be lacking in health care?

In a report of the European Spreadsheet Risks Interest Group (EuSpRIG), Grenville Croll and Raymond Butler discuss this matter under the eye-catching title — *Spreadsheets in Clinical Medicine-A Public Health Warning*.^{*} The authors reveal the existence of regular, significant, and unexpected financial losses experienced as a result of spreadsheet errors and inquire into the clinical implications of poorly constructed and untested spreadsheets in use by doctors and nurses.

In an exercise that is alarming on the face of it, they review a widely available spreadsheet for drug dose calculations for pre-, peri-, and post-operative care of children, including narcotics, analgesics, antibiotics, muscle relaxants, and emergency medications. Among shortcomings they identified in this program were:

- Although password protected, the spreadsheet and all underlying formulae could be globally copied and pasted into a new worksheet or spreadsheet document allowing unfettered manipulation of formulae and cell data.
- While most dosages were reported in milligrams (mg), some were reported in micrograms (mcg) in the same column labeled “mg.”
- Documentation of the spreadsheet’s functions and instructions for use was not present in the file — but located elsewhere in the source web site.
- Data validation was not employed to assure accurate and appropriate data input.
- Because of their “cut and paste” simplicity, there would be no opportunity for “product recalls” or “user alerts” in the event of manufacturer change to dosing constants used in the spreadsheet, or other errors that might be identified.

Conceding that they conducted no research into the actual application of this tool in the clinical environment, the authors pointed out that even limited incorrect use of such tools may be an unstudied contributing factor to the estimated 100,000 lives lost to medical errors in the United States last year. They concluded, “Documentation relating to the use of spreadsheets in clinical medicine invariably states that ultimate responsibility for the use of such spreadsheets lies with the user. Such is the case in business where the spreadsheet user, often a highly qualified and experienced business professional, bears ultimate responsibility. We believe, in each case, that delegation of responsibility is no barrier to the repeated perpetration of grave errors.”

* www.eusprig.org/2006/spreadsheets-in-clinical-medicine-warning.pdf



2. Create a spreadsheet inventory

Once in-scope spreadsheets have been identified, they should be documented in an inventory. Useful information that should be captured in this inventory includes:

- the spreadsheet's name
- the owner/creator
- who uses it
- what it does
- whether it is financial or operational in nature
- the magnitude (i.e., the dollar value or operational quantity) of the spreadsheet
- the degree of confidentiality of the data
- the proprietary nature or sensitivity of data.

Which option best describes the level your company utilizes spreadsheets to support business processes or financial reporting?

Votes received:	2,804
Heavy. We rely on spreadsheets for critical portions of the business	70.1%
Limited. We have some use of spreadsheets, but significant spreadsheet errors could not impact the business	23.3%
None. We do not use spreadsheets	0.3%
Don't know/Not applicable	6.3%

3. Rank the spreadsheet's risk level

Determining each spreadsheet's risk level should be based on its complexity and the magnitude of the data being processed.

Complexity: The level of spreadsheet complexity varies greatly from file to file. In general, complexity levels can be classified as:

- **Rudimentary** — Containing no significant calculations to transform the input data and used primarily as simple interfaces or summary reports.
- **Light** — In which some calculations are used, but their use is limited. For instance, a reviewer with limited spreadsheet skills can interpret the purpose and effectiveness of these formulas through observation and without outside explanation.
- **Intermediate** — Leveraging more complex arithmetic functionality to accomplish their goals. For example, a reviewer who is proficient in the use of spreadsheets might need additional information to interpret the purpose and effectiveness of the formulas in the spreadsheet.
- **Advanced** — These spreadsheets contain a high degree of complexity and leverage advanced spreadsheet functionality, such as macros or pivot tables. They may also link to other spreadsheets or associated documents, tables, programs, or websites.

Magnitude: Spreadsheet magnitude thresholds should be established on a project basis as well as defined by the environment and risk appetite that is specific to the department or process being reviewed. Potential categories for each magnitude level include:

- **Immaterial** — A threshold establishing the minimum magnitude necessary for a spreadsheet to be considered material should be established. Any spreadsheet that processes or calculates dollar values or operational quantities less than this threshold should be considered to be of "immaterial magnitude."
- **Material** — Spreadsheets processing a dollar value or operational quantity above the specified threshold should be considered to be material.
- **Critical** — A critical threshold should be established to flag spreadsheets that process an extremely high-dollar value or operational quantity.

Once a spreadsheet's complexity and magnitude have been established, auditors can determine its associated risk. The following chart demonstrates how risk can be determined based on the spreadsheet's complexity and magnitude attributes.

Based on the project's needs, auditors can identify the specific categories of "risk-ranked" spreadsheets that need to be the focus of the audit review. For instance, a spreadsheet with a calculated risk ranking of high or medium in each category (i.e., magnitude and complexity) might be considered to be in-scope for a particular review.

Risk Rank		Complexity			
		Rudimentary	Light	Intermediate	Advanced
Magnitude	Critical	Low	Medium	High	High
	Material	Low	Medium	Medium	High
	Immaterial	Low	Low	Low	Low

Figure: Example of how to assign risk levels based on complexity and magnitude attributes.



4. Develop a spreadsheet baseline

Creating spreadsheet baselines typically represent the majority of time that will be spent on a spreadsheet audit. The purpose of baselining is to isolate, whether through manual or automated processes, a point in time that the spreadsheet is functioning in accordance with management's intentions. This process can be divided into two components:

- **Validate:** A spreadsheet generates results (i.e., outputs) by applying formulas to source data (i.e., inputs). Therefore, the first step in baselining a spreadsheet is to identify the fields containing input data. These fields can be manually keyed or populated by an automated macro that obtains the data from another file. Once input data has been identified, it must be compared to the actual source from which the data came. This will enable the auditor to verify that the data made the transition to the spreadsheet completely and accurately, whether through manual or automated input.
- **Verify:** Confirm that formulas are functioning in accordance with management's intentions. Once inputs have been validated, the formulas in the spreadsheet

need to be tested. There are two primary components to this: 1) ensuring that the formula being used is the proper formula (e.g., "should the Black-Sholes method be used to calculate stock option valuation?"; and 2) ensuring that the formula has been entered correctly (e.g., all parentheses or other nesting devices and symbols are in the right place, all rows/columns are included). Understanding the purpose of the formulas used in the spreadsheet and verifying that they were configured properly to provide accurate outputs accomplishes the verification objective.

5. Evaluate policies and procedures for spreadsheet use

Baselining a spreadsheet will identify the integrity of the file's formulas and data at a specific point in time. Once a spreadsheet baseline has been established, it can be relied on in the future only if controls are implemented to protect the integrity of the baselined spreadsheet. While policies are not a control, an effective and efficient control environment starts with the implementation of formal policies and procedures. Hence, a comprehensive spreadsheet management audit should include the review and evaluation of these policies and procedures, as well as recommendations for their improvement, if necessary.



6. Review controls that protect spreadsheet baselines

Finally, auditors need to review the effectiveness of controls in protecting the integrity of established spreadsheet baselines or recommend their implementation where lacking. The table below identifies seven controls that can help organizations accomplish this task. These controls support data integrity and availability by detecting or auditing contact with spreadsheets and their data and include preventive measures to preserve data and its attendant integrity.

Goal	Disposition	Control
Integrity	Detective	Versioning should be employed in all spreadsheet changes. Changes to a spreadsheet should include some form of unique identifier that can be used by parties to differentiate versions of the spreadsheet.
Integrity	Detective	All changes to a spreadsheet are reviewed and approved. Someone other than the party making the change should perform this. The review process should guide the reviewer to confirm that the changes are functioning in accordance with management's intentions, and the integrity of the spreadsheet's formulas, data, and results have not been compromised.
Integrity	Preventive or Detective	The validity of spreadsheet inputs should be ascertained. Whether input data is manually keyed or imported, steps should be taken to confirm input data being imported into the spreadsheet is complete and accurate.
Availability	Preventive	Spreadsheets should reside on file servers. The primary copies of critical spreadsheets should not reside on portable or end-user computers.
Availability	Preventive	Spreadsheet files are backed up to external media. The frequency of the file backups should be sufficient to support business data recovery needs.
Integrity	Preventive	Spreadsheet files should be protected with some form of access control. Users without a business need to open the spreadsheet should be prevented from doing so. This can be done by restricting access to the file itself, or the folder in which the spreadsheet is stored.
Integrity	Preventive	Non-input-related spreadsheet fields are password protected. All fields, such as formulas, that do not need to be edited by the end user, but are necessary for the accurate employment of the spreadsheet, should be password protected to prevent unauthorized changes.

Controls to protect spreadsheet baselines

Which of the following best describes the spreadsheet management method for your company?

Votes received:	2,679
Automated solution seems to be a good fit for my company	25.8%
I like the idea of an automated solution, but my company doesn't rely on spreadsheets enough to justify one	12.3%
My company relies on spreadsheets and I feel manual controls are most appropriate for our environment	30.2%
I don't know enough about how we are using spreadsheets to conclude which method would be most appropriate for us	19.6%
Don't know/Not applicable	12.1%

Implementation of controls: Some of the controls described in the table above can be managed manually within existing spreadsheet program packages and by management oversight and direction. For greater protection of the integrity of critical spreadsheets, there are commercially available tools on the market that expand on the efficiency and reliability of more manual models. These tools focus primarily on security and change controls. Some studies have suggested that automated management tools present advantages including:

- greater ease in identifying and inventorying of spreadsheets
- efficient and automated analysis of spreadsheet complexity
- identification of errors
- greater security
- improved management of change control and versioning
- improved audit trail functionality.

These advantages need to be compared to the initial cost and installation of management tools and their ongoing maintenance. In assessing automated spreadsheet management, it is vital that the organization employ due diligence in evaluating both the application and its supporting organization when purchasing third-party software.

Timeline for implementation: While a spreadsheet environment review can consist of all or some of the steps described earlier, the cornerstone of this work is the spreadsheet baseline. Because this step requires the greatest amount of time to complete, its requirements should not be underestimated during the planning process. The purpose of baselining is to determine the spreadsheet's integrity, while established controls need to protect the baseline after its validation. Hence, if controls are not implemented to protect the spreadsheet's integrity, the spreadsheet needs to be re-baselined prior to each subsequent evaluation so that the integrity of its formulas can be re-established.





Spreadsheet security about process, not technology

As developer and owner of the spreadsheet application resident on 90% of computing desktops globally, Microsoft Corporation has a vested interest in maintaining the highest level of confidence in the integrity and reliability of Excel and its other software applications. While the developer bears no responsibility for an end-user's mistaken or malicious misuse of an application, user and regulator confidence in its use is a critical element to its success in the marketplace.

Microsoft publishes a number of spreadsheet security and compliance whitepapers; visit www.microsoft.com/security to access (registration required).

Common threads emerge from a review of several of these whitepapers. Spreadsheet security and compliance is not primarily a technological issue — but a process issue requiring sound practices in development, testing, deployment, maintenance, and use. Cooperation and utilization must be championed at the highest executive and management levels for spreadsheet security to be effective. And a commitment of resources sufficient for the task is critical.

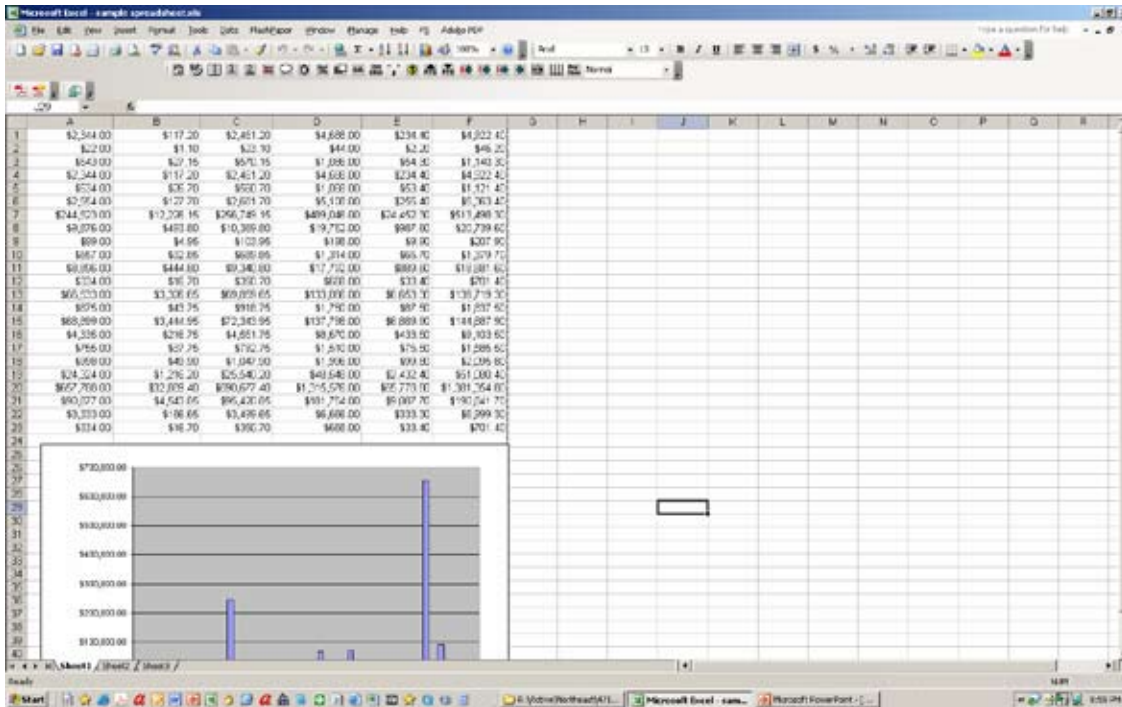
Within Excel itself, Microsoft encourages application users and developers to acquire a comprehensive understanding of capabilities resident in the program to protect, monitor, and manage the data including use of unique cell formatting to visually clarify spreadsheet structure to reduce errors. Password protecting and/or locking critical cells is encouraged.

Recent versions of Excel recognize tables as a native structure within spreadsheets allowing authorized users to perform formatting and data input tasks that will automatically adjust anything associated with the table. Also, formulas can be adjusted using header names (e.g., Sales) rather than the sometimes difficult to understand A-1 style of address (e.g., D1:D25). Microsoft characterize this as "structured referencing" and suggests it improves the readability of formulas and makes them easier to maintain and edit.

Finally, Excel 2007 provides auditing tools to enhance transparency and usage tracking that provide the ability to:

- graphically display or trace the relationships between cells and formulas
- trace a cell's precedents (data providers), and dependants (recipients of a cell's data)
- check for errors in formulas.

Incorporation of a spreadsheet application's internal capabilities can augment other risk management activities in an effective way.



Once controls are implemented, auditors need to identify whether protected spreadsheets have changed since the last baseline. Performing the baseline testing after controls are implemented most easily proves this. If this is not possible or convenient, protected spreadsheets can be compared to their baselined counterparts through the use of a tool. Auditors also can advise that controls meant to protect the integrity of spreadsheet baselines extend to all in-scope spreadsheets.

Finally, if controls are implemented, subsequent audits should verify that they are in place and functioning as designed. For instance, if an organization under review has implemented the controls described above, all of the controls surrounding spreadsheet integrity should be verified to have been functioning since the previous review. If this is the case, no further testing may be necessary since the two availability controls are important to business operations but are not required to protect the baseline. However, if any of the integrity controls fail, all spreadsheets associated with the failed control should be re-baselined.

Does your company evaluate and protect spreadsheets that are important to the business?

Votes received:	2,797
We employ specialized techniques to control and manage spreadsheets, and periodically evaluate these controls	33.9%
We look at the spreadsheets, but have little or no specific processes to confirm the spreadsheets are functioning in accordance with management’s intentions	42.7%
We recognize that there are spreadsheets, but do not undertake special measures to protect and test them	14.6%
I don’t know enough about how we are using spreadsheets to conclude which method would be most appropriate for us	19.7%
Don’t know/Not applicable	8.8%

A sampling of laws and regulations potentially affecting spreadsheet management

Law or regulation	Issuing authority	Primarily applies to
Basel II	International	Banks and financial institutions
California SB 1386	State of California	All companies doing business in California
Data Protection Act	U.K.	Companies doing business in the U.K.
DoD 5015.2	U.S.	Government contractors
Financial Industry Regulatory Authority (FINRA),	U.S.	Securities Firms
Gramm-Leach-Bliley Act (GLBA)	U.S.	Financial institutions
HIPAA	U.S.	Healthcare, Insurance companies, firms with access to employee or patient healthcare data
Centers for Medicare & Medicaid Services (OIG)	U.S.	Firms benefiting from Retiree Drug Subsidy (RDS) program
Markets in Financial Instruments Directive (MiFID)	U.K.	Banks and Financial institutions
Patriot Act	U.S.	Companies doing business in the U.S.
Sarbanes-Oxley	U.S.	Public companies

Conclusion

Spreadsheet Management Solutions are straightforward, but they are not easy.

Implementation of SMS can be a critical process in risk management controls for compliance and security. However, they also command substantial resources and management engagement to be successful. An important first step is to identify when and how SMS tools should be installed. Some criteria include:

- as a component of Sarbanes-Oxley readiness or testing projects
- at any critical step in operations that rely upon spreadsheets
- during any large systems implementation, replacement, or restructuring
- for controls around the storage and maintenance of data subject to regulatory requirement (e.g., HIPAA)
- in the context of privacy reviews involving personally identifiable information stored in spreadsheets
- when using financial data management software (e.g., Hyperion)
- as a part of any business process review involving spreadsheets.



It is of equal importance that an organization takes care not to underestimate the time needed to baseline a spreadsheet as part of the initiation of SMS. At first glance, the task seems easy and quick. Experience has shown that many spreadsheets can be baselined in as little as 15 minutes, but others have taken up to 40 hours or longer. Don't under-budget in this area.

Spreadsheet owners often do not fully understand the formulas contained in their spreadsheet. If the spreadsheet is complex and the owner is not the creator, it would generally be helpful to track down the spreadsheet creator to help baseline the spreadsheet.

Spreadsheet owners often do not fully understand the inputs to their spreadsheets. This condition provides additional risk for the spreadsheet and complicates the baselining process.

An organization's auditor is prohibited from auditing its own work. Spreadsheets often are a component of a company's accounting or financial reporting systems, or internal controls. Accordingly, Spreadsheet Management Solutions activities, such as the performance of a spreadsheet inventory, the performance of a risk ranking,

the design or implementation of controls, the assessment of the integrity of spreadsheet formulas or inputs, or the drafting of policies and procedures is best performed internally or contracted to an outside vendor with specific expertise in this arena.

In spite of certain regulatory constraints, an external auditor can offer valuable assessment services to their clients pertaining to spreadsheets. For example, they may be engaged to gain an understanding of the client's use of and controls over spreadsheets, compare that understanding with preferred practices, and provide findings and recommendations regarding gaps or areas for improvement. They also may act as a coach through an organization's own processes to secure a controlled environment for spreadsheets, providing insights into successfully implemented practices, and advice and recommendations along the way.

In one survey of business executives conducted by Deloitte, spreadsheet security was the third most commonly voiced concern when they were asked, "What would you consider your most pressing and urgent IT deficiency?" Installation of SMS tools for spreadsheet control and management can be a powerful device for putting those particular fears to rest.

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