

THE GOVERNANCE OF RISK ARISING FROM THE USE OF SPREADSHEETS IN ORGANISATIONS

*Tessa Minter**, *Carlos Correia***

Abstract

The key to maximising the effectiveness of spreadsheet models for critical decision making is appropriate risk governance. Those responsible for governance need, at a macro level, to identify the specific spreadsheet risks, determine the reasons for such exposures and establish where and when risk exposures occur from point of initiation to usage and storage. It is essential to identify which parties could create the exposure taking cognisance of the entire supply chain of the organisation. If management's risk strategy is to control the risks then the question reverts to how these risks can be prevented and/or detected and corrected? This paper attempts to address each of these critical issues and to offer guidance in the governance of spreadsheet risk. The paper identifies the the risk exposures and sets out the responsibilities of directors in relation to spreadsheets and the spreadsheet cycle. Spreadsheet risk exposure can be managed in terms of setting the control environment, undertaking risk assessment, providing the requisite information and communicating with internal and external parties as well as implementing spreadsheet lifecycle application controls and monitoring activities.

Keywords: Spreadsheet Governance, Spreadsheet Risk, Spreadsheet Lifecycle

JEL classification: M42

* Associate Professor Tessa Minter, College of Accounting, University of Cape Town, Private Bag X3, Rondebosch, South Africa
Email: tessa.minter@uct.ac.za

** College of Accounting, University of Cape Town

1. Introduction

Those charged with the governance of an entity have a responsibility for the “establishment of structures and processes, with appropriate checks and balances that enable directors to discharge their legal responsibilities, and oversee compliance with legislation.” (Institute of Directors in Southern Africa, the King III report, 2009, p.8). The criticality of Spreadsheets in business and daily life is becoming more pervasive and spreadsheets are being increasingly used for mission-critical applications (Grossman, Mehrotra & Ozluk, 2006) and for internal and external reporting purposes. A simple mismatch of columns can result in incorrect results for patients, students, prize-winners, analysts, financial managers and investors amongst many others. There is a vast range of errors on which there is on-going analysis and there have been numerous studies on the nature and type of errors within Spreadsheets and the development of a variety of taxonomies of errors (Panko, 2006). Serendipity often plays a part in recognising these errors that can have life changing impacts on individuals, companies and industries. How much more difficult is it then to detect an issue

if there is intent to deceive or manipulate the Spreadsheet information? The impacts increase with the specific characteristics of the Spreadsheet involved including the complexity of the models, the size of the spreadsheet, the number of versions or users, the attitude and competency of the individuals involved and the decision-making that follows from the information.

In addition, errors and irregularities can occur at any stage in the Spreadsheet lifecycle from the initial decision to use a spreadsheet, to its ultimate destination perhaps as stored data or its use terminated. Having identified the threats to the organisation and assessed the risks, where they are significant, management then have a responsibility to respond to the risk by accepting, avoiding, transferring or controlling the risk. Should management's risk appetite result in the option to control the risk they have the option to prevent the errors or irregularities or to detect and correct them or to do both. This will require the application of the internal control components, as set out in International Standard on Auditing, ISA 315 in Appendix 1 (International Auditing and Assurance Standards Board, 2010; pp.305-310).

2. Management Responsibility

The Institute of Directors' King III report (2009) further amplifies through the principles; management's responsibilities that would be applicable to the use of significant Spreadsheets. Principle 2.7 states that the board should be responsible for the governance of risk (Institute of Directors in Southern Africa, King III report, 2009, p.23). Principle 4.2 states that the board should determine the levels of risk tolerance (Institute of Directors in Southern Africa, King III report, 2009, p.36). Principle 4.4 states that the board should delegate to management the responsibility to design implement and monitor the risk management plan (Institute of Directors in Southern Africa, King III report, 2009, p.37).

In terms of Principle 4.5, the board of directors should ensure that risk assessments are performed on a continual basis (Institute of Directors in Southern Africa, King III report, 2009, p.37) and in Principle 4.9, the board is required to receive assurance regarding the effectiveness of the risk management process (Institute of Directors in Southern Africa, King III report, 2009, p.38). Principle 5 is invoked

when the effectiveness of significant Spreadsheets is dependent on the overall IT governance of the organisation. In addition these Spreadsheets will in all probability need to adhere to applicable laws, rules, codes and standards which are referred to in principle 6. Where there is a risk based internal audit function and the use of Spreadsheets poses a significant risk to the organisation this will raise the issues in principle 7, which refers to the internal audit function.

As the board is responsible for the organisation-wide risk management and not the day to day operational risk management this article does not address the specific spreadsheet error types and techniques in detail. For some examples of these and references to further studies the reader is referred to Correia & Minter (2011).

Caldwell (2012; p.14) has usefully outlined the responsibilities of the board of directors within a risk oversight framework and sets this out in a nine-step process, which is restated below (I – IX). The application of these responsibilities to Spreadsheets used within the business and within the risk management process has been set out in Table 1.

Table 1. Application of Caldwell's risk framework to spreadsheets

Caldwell's Risk Oversight Framework		Application of responsibilities to spreadsheets
I	Establish context Understand current conditions, in which the organization operates from an internal, external and risk management perspective.	Are these reflected in parameters used by those who are responsible for the design, input and use of the spreadsheets?
II	Identify risks Document material threats to the organization's achievement of its objectives and value of its assets.	Which are the key decisions and reporting obligations dependent upon the use of spreadsheets that could exacerbate these threats? These are further expanded by management setting the internal control objectives of spreadsheets
III	Analyse consequences Quantify the impact of the risk and likelihood of occurrence	The recording of these decisions is often undertaken utilising spreadsheets.
IV	Analyze interconnectivities and compounding effects Aggregate risks and understand relationships, interdependencies, and the compounding effect of simultaneous occurrences	What are the relationships between the spreadsheets and the parameters used and the possibility in particular of circular references
V	Re-analyse consequences Re-calibrate and, if possible, create probability distributions of outcomes of interrelated risks	Spreadsheets are an essential tool in the use of "what-if scenarios" and the calculation of probabilities
VI	Prioritise Rank risks in order of importance, blending severity with likelihood of occurrence and potential for mitigation	Once again spreadsheets are often used as a significant tool in the ranking processes.
VII	Assess Risk Capacity, Tolerance and Risk Appetite Assess Risk Capacity, Tolerance and Risk Appetite	It is important to assess risk capacity, tolerance and risk appetite within a spreadsheet environment
VIII	Choose Response Strategy Develop plans to avoid, reduce or control, share or insure, accept, or, in certain cases, potentially exploit risks	These plans will include the overview of the process to be followed by those responsible for the operational aspects including the design and utilisation of spreadsheets throughout the organisation.
IX	Monitor Continually measure and monitor the risk environment and the performance of the risk management strategies	This will include the use of significant spreadsheets in the making of decisions.

3. What is the particular risk exposure to the organisation?

In the majority of organisations, and of particular relevance in the financial and banking sectors of the economy, the creation and use of spreadsheets should be regarded as an asset. To determine the risk exposures one needs to determine the objectives to be achieved. These include the generally accepted definition of internal control objectives set out in the International Auditing Standard ISA 315 which relate to “the achievement of an entity’s objectives with regard to reliability of financial reporting, effectiveness and efficiency of operations, and compliance with applicable laws and regulations” (International Auditing and Assurance Standards Board, 2010: p.264)

The plethora of legislation arising from corporate failures has increased the risk of non-compliance relating to legislative and regulatory laws such as Sarbanes-Oxley, the operational risk section of Basel 11, various other laws, including privacy laws and those laws relating to the retention and admissibility of electronic records.

It is suggested that there are a number of sub-objectives relevant to spreadsheets that fall within the overall effectiveness and efficiency of operations including:

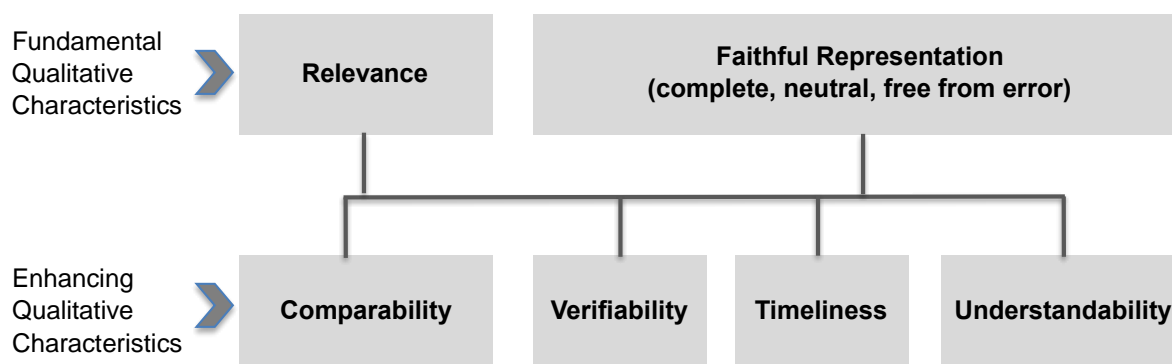
- the confidentiality of the spreadsheet information throughout its lifecycle,
- the availability of the spreadsheet according to business needs which may include the possibility of providing the spreadsheets as evidence in a court of law and,
- the safeguarding of the spreadsheet as the modelling and information contained therein are a critical resource.

In addition, if any spreadsheets used in the preparation for, or process of, reporting internally or externally they need to meet the qualitative characteristics listed in Figure 1 below (International Auditing and Assurance Standards Board, 2011: p.12). There was much international discussion on the need to replace reliability with faithful representation in the Hierarchy of Qualitative Characteristics (International Auditing and Assurance Standards Board, 2011; p.12). This we believe is conceptually relevant to the governance of spreadsheets which often employ estimates in a number of parameters which are faithful representations but may not be necessarily reliable. This is illustrated in paragraph QC 15 of the International Accounting Standards Board’s (IASB) Conceptual Framework for Financial Reporting (International Accounting Standards Board, 2011; p.85) which states:

“Faithful representation does not mean accurate in all respects. Free from error means there are no errors or omissions in the description of the phenomenon, and the process used to produce the reported information has been selected and applied with no errors in the process. In this context, free from error does not mean perfectly accurate in all respects. For example, an estimate of an unobservable price or value cannot be determined to be accurate or inaccurate. However, a representation of that estimate can be faithful if the amount is described clearly and accurately as being an estimate, the nature and limitations of the estimating process are explained, and no errors have been made in selecting and applying an appropriate process for developing the estimate.”

Thus the processes employed and basis for the estimates used in spreadsheets may be key risk areas.

Figure 1. Hierarchy of Qualitative Characteristics



(Source: International Auditing and Assurance Standards Board, 2011; p.12)

4. Where and when is the risk exposure within the spreadsheet lifecycle?

From a Governance perspective it is essential that management identify that the risk exposure can occur at any stage in the spreadsheet lifecycle. This

involves the following stages, from point of initiation where the need for a spreadsheet is identified, the design and testing thereof, the debugging, (the locating and correcting of errors in code, formulae and logic), the populating of the spreadsheet, the use of the spreadsheet, the changes thereafter and the

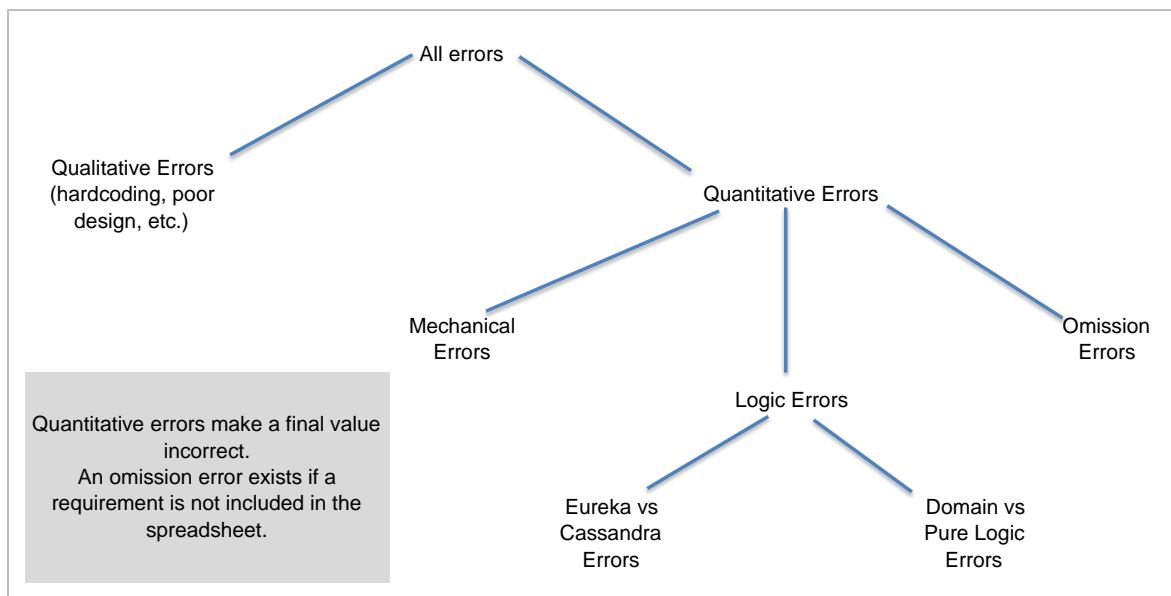
version control of the spreadsheet to its termination in use and storage. These stages form part of the audit trail required for taxation, legislative and regulatory purposes. Lemieux (2008) refers to *archiving* as the overlooked spreadsheet risk. In addition the operation of the spreadsheet is dependent on the general IT environment and thus the spreadsheet integrity is reliant on the effectiveness of the access, change and continuity aspects of general IT governance.

5. Why would there be risk exposure?

The risk of human error is exacerbated by issues such as overconfidence, exhaustion, insufficient time, incompetence and inexperience. This is combined

with the characteristics of a spreadsheet including free design, complexity of structure and formulae, size, multiplicity of cells in which to enter code or numbers, spreadsheet generated calculations that automatically update other key management reports or information, concentration of knowledge and ease of access. The combination of the human factor and the intrinsic nature of spreadsheets imply that there is a significant likelihood of errors in spreadsheets. Panko & Aurigemma (2010) have divided errors into qualitative and quantitative errors per the taxonomy in Figure 2 below which classifies the errors according to type of error.

Figure 2. Type of spreadsheet errors



An alternative classification by Powell, Baker & Lawson (2008) more closely associated with the spreadsheet lifecycle, is set out in Figure 3. Note the addition of the qualitative aspect of temporal errors referring to those using out of date data and the concept of hidden errors which are not visible except in use.

The true frequency of errors will never be known but the literature and the popular press support the conclusion that it is a significant risk. The results of a survey by Powell, Baker & Lawson (2009) are depicted in Figure 4, which indicate the frequency of errors.

Of interest is the range of errors from \$0 to >\$100,000,000 and the finding that 47 errors were found that had no impact on the spreadsheet. These arose from issues such as formulae with erroneous references but where the erroneous reference and the correct input values were the same.

Coster *et al* (2011) surveyed 38 companies (25 companies had assets between \$1bn and \$100bn) in respect to compliance with the Sarbanes-Oxley Act of

2002 (SOX) particularly in relation to spreadsheet risks and found that the processes where implementing controls were most difficult relate to change management, access control and version management. Leon *et al* (2012) found that input controls, change management, access control and version management represent the most difficult processes to control.

Further, Leon *et al* (2012) report that for most of the firms studied there was a lack of or incomplete documented policies for access control, change and version management and the reviewing and monitoring of spreadsheets.

Glater (2003) outlines a very significant error that was found in a Fannie Mae spreadsheet. Fannie Mae were adopting new and complex accounting standards under time pressure which involved marking to market their open positions using their internal systems and spreadsheets. There was an error in the applicable spreadsheet, which resulted in errors greater than \$1.2 billion.

Figure 3. The spreadsheet cycle

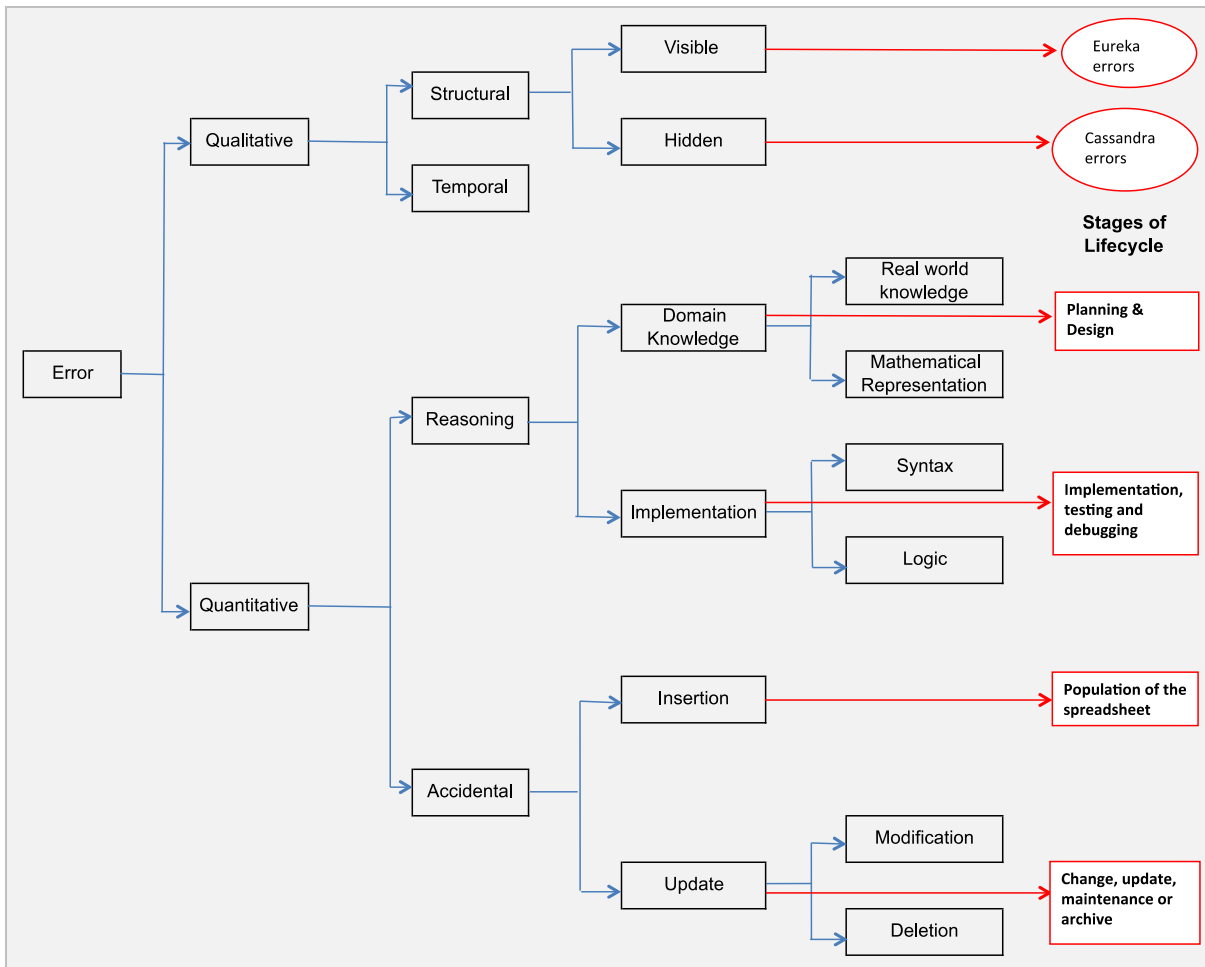
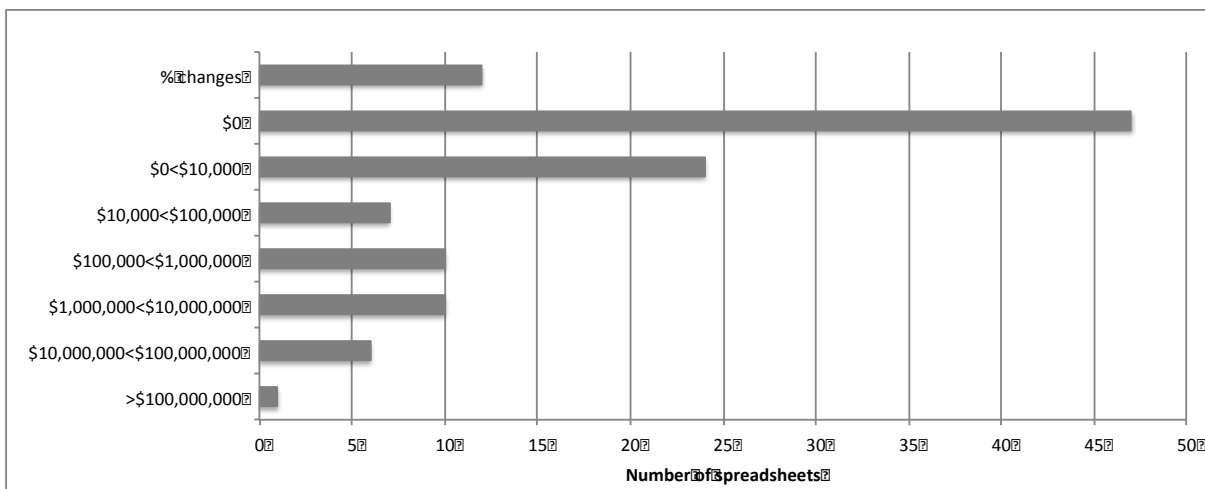


Figure 4. Frequency of errors



This is further explained on The Auditor™ (2012) website as follows;

"There were honest mistakes made in a spreadsheet used in the implementation of a new accounting standard...which resulted in increases to unrealized gains on securities, accumulated other comprehensive income, and total shareholder equity

(of \$1.279 billion, \$1.136 billion, and \$1.136 billion, respectively)"

A further risk of error is the correction of identified errors. Where spreadsheets are used in activities on which there are often incentives offered for pre-determined results the motivation and opportunity may exist for fraudulent design, input,

alteration or manipulation of spreadsheets or the omission or concealment of required information.

A well-cited example of the use of spreadsheets to commit fraud is the fraud committed by John Rusnak, a former currency trader with Allied Irish Bank. Mr Rusnak used spreadsheets to subvert the systems controls and this resulted in a fraud which lost \$691 million for the bank. According to Butler (2009);

the spreadsheet was corrupt as the cells for the Yen and Euro - the two currencies in which Rusnak traded the most - had links to Rusnak's computer that detoured outside of Reuters. the risk assessment analyst discovered that the source of daily foreign exchange rates was not independent...

The risk of both fraud and error is exacerbated where the spreadsheet developer and user is the same person.

6. Who could create the risk exposure?

With today's integrated information systems one needs to consider all the personnel throughout the entire supply chain of the organisation who may be in a position to commit fraud or error at any stage throughout the spreadsheet lifecycle. This may arise from activities such as reading the spreadsheet and accessing confidential information, changing, deleting, omitting or adding information.

Governance therefore involves the consideration of the threat of fraud or error being committed by any person who has either authorised or unauthorised access to the spreadsheet. Where this threat is likely in a given situation, a risk then arises on which management need to make a decision on how to respond.

Possible personnel to be considered include;

- Suppliers or customers, which in the financial services industry could include brokers, funders and dealers.
- Any authorised third parties to whom business activities that are not core to the organisation are outsourced. This often applies to the organisation's information technology services such as internet service providers, database managers, the use of cloud computing and the management of the hardware and system software.
- Management at both operational and board level.
- Internal employees who are authorised to access the spreadsheets
- Internal employees who are unauthorised to access the spreadsheets.
- Unauthorised third parties otherwise known as hackers.

7. How can spreadsheet risk exposure be prevented and/or detected and corrected?

The key is to develop a framework to ensure that the solutions are proactive and not just reactive and that

there is a systematic approach rather than a random application of techniques. The governance of spreadsheet risk is only as strong as the weakest link in the process. In addition, management do not wish to compromise the efficiency of the spreadsheet lifecycle by installing unnecessary controls that could cost time and money and affect staff morale.

To assist the body responsible for the governance of spreadsheet risk, the use of a framework is recommended. The most recognised framework is the Internal Control Components outlined in International Standard on Auditing ISA 315 (International Auditing and Assurance Standards Board, 2010) which is based on the framework as set by the original Committee of Sponsoring Organisations of the Treadway Commission (COSO). In December 2011, COSO (assisted by PwC) released a draft of the Updated Internal Control Framework to accommodate changes in the business and operating environments (Castelluccio, 2012) and the final Internal Control-Integrated Framework was released in May 2013 (COSO, 2013).

However, the five components of the framework relating to the *control environment, risk assessment, information and communication, control activities and monitoring* have not changed and are expanded upon below particularly in relation to the responsibilities of the board of directors and management.

7.1 Control environment

Management need to set the "tone" of the organisation with a commitment to integrity and ethics to reduce the risk of fraud, and to competence to reduce the risk of errors. There should be clear reporting lines relating to spreadsheet activities. The human resource lifecycle policies including hiring, training, evaluation, remuneration and career progression or termination of the individuals involved throughout the spreadsheet lifecycle should be commensurate with the behaviour required.

Management should implement policies and guidelines in respect of:

- Access to resources including significant spreadsheets which may represent valuable intellectual property of the company. Consideration should be given to both physical and logical access controls throughout the information system.
- The development, testing, use and storage of spreadsheets.

Management should ensure that adherence to the above policies and guidelines are monitored and non-compliance is addressed timeously and appropriately.

7.2 Risk assessment

Management need to apply the objectives outlined in section 1 of this article and the possible sources of access throughout the spreadsheet lifecycle to identify

the risks. Management should continually assess the impact of the changing political, economic, social, legal and technological environment on spreadsheet risk.

7.3 Information and Communication

Management should ensure that there is sufficient and appropriate information relating to the use and control of spreadsheets and that it is communicated to all the relevant internal and external parties, who should be committed to, and understand their responsibilities. This is necessary to meet all the internal control objectives but especially accuracy, continuity and accountability. The information should include the policies and procedures that govern the spreadsheet lifecycle and detail the purpose, assumptions and logic used in the spreadsheet to ensure that there is evidence and support for any corporate decisions made using the spreadsheet content.

Documentation should be such that another person can use, change or update the spreadsheet model even after a lapse of time.

At a minimum: the documentation should include:

- The purpose of the spreadsheet, the objectives of the model, (what it does) and the basic structure, (how it does it). This could include a dependency graph showing the relationships within the spreadsheet.
- Who was involved in the various stages of the spreadsheet lifecycle and when.
- The assumptions made during its design and population and any amendments to those assumptions made in subsequent updates.
- The constants and required input data sources.
- The testing regime and corrections made.
- The version history and reason for the updates/changes (see Butler, 2001)

7.4 Control activities

General IT controls

No matter what control activities are built into the spreadsheet lifecycle they will only be as effective as the organisation's controls over the information technology that supports all the IT tasks. This is a separate risk which would impact all the applications throughout the computerised information system. Broadly, the IT controls should ensure that:

- Any changes made to system software such as the security and communications software, any database management, disaster management and back-up provisions do not impact the spreadsheets.
- Any access is controlled via secure identification and authentication procedures; all of which are recorded in a secure audit trail.

- All operational activities in the general IT environment are controlled.

There are a number of accepted frameworks to assist management in the governance of IT. One commonly used framework is Control Objectives for Information Technology (COBIT). In addition, Goldman and Ahuja (2011) have integrated COBIT and balanced scorecard (BSC) frameworks, in conjunction with Systems Security Engineering Capability Maturity Model (SSE-CMM) as a tool for performance measurement and evaluation of spreadsheets

Spreadsheet lifecycle application controls

There are numerous studies (see for example, Leon et al, 2012; Barnes et al, 2009; Ferreira & Visser, 2012) outlining detailed controls addressing various stages of the spreadsheet lifecycle, and the provision of controls built into specialised applications e.g. banking and investment, specific products/tools e.g. Microsoft Excel, Oracle Crystal Ball®, bbv Software Services AG.

Applying the organisation's overall control philosophy in respect of the requisite levels of competence, management would need to have guidelines/controls in place to ensure that the spreadsheet designer/developer has the relevant domain knowledge, training in the tools being utilised and awareness of error types. This control philosophy would also offer guidance as to whether management wishes to prevent errors and /or detect and correct errors. However there are common principles that are key, such as authorisation, segregation of duties, performance reviews, information processing and physical controls as set out in International Standard on Auditing, ISA 315, (International Auditing and Assurance Standards Board, 2010; para.A96):

- *Authorization.*

Whilst the general IT controls authenticate who is accessing the system there should be accepted protocols of who is authorized to perform certain functions within the spreadsheet lifecycle e.g. who can design the spreadsheet, use and read the spreadsheet, who can amend the spreadsheet and to what extent. Can they change inputs but not any formulae? Can they add or delete functions?

- *Segregation of duties.*

Where a person is in a position where s/he has a responsibility for more than one business activity e.g. as developer and user of a spreadsheet, there is the possibility of intentional manipulation to produce results that will reflect positively on either the individual or the organization or both. In terms of International Standard on Auditing, ISA 315 (International Auditing and Assurance Standards Board, 2010; Appendix 1, p.309):

The segregation of duties is intended to reduce the opportunities to allow any person to be in a

position to both perpetrate and conceal errors or fraud in the normal course of the person's duties.

Ideally the developer should not be the user. However this is often the situation that arises in organizations because of business needs and knowledge domain specialisations. If this separation is not possible then there should at least be an independent check of the spreadsheet design. Research undertaken by Vemula, Ball & Thorne (2008) indicates that group development may be more effective than cross checking especially when the development group consists of more than two people.

- *Performance reviews.*

This requires a dedicated responsibility for one or more individuals to review the overall reasonability of the inputs and outputs of a spreadsheet in relation to the overall business knowledge and to each other and in comparison with previous or budgeted/forecast results and then to take any necessary corrective actions. The key issues for effectiveness of these reviews are the objectivity and holistic economic, industry, business and domain knowledge of the person(s) performing the review.

- *Information processing.*

Nixon & Ohara (2010) proved conclusively that auditing software tools are useful in pointing the user in the right direction but the tools themselves do not detect and correct the errors. In addition to auditing software tools the developer and user have a range of techniques that can be undertaken manually, or built into the spreadsheets, to check both the logic of and input into the spreadsheet. These techniques are a research area on their own and from a governance perspective management need to have assurance that there is an awareness of these techniques and that the capability and access exist to maximize the use of these resources to address some key risk areas. At a basic level these include automated controls such as edit and validation checks of input data and numerical sequence checks where appropriate. Undertaking reasonability and logic tests of output, in comparison to domain knowledge and previous outcomes and trends, are another form of control.

- *Physical controls.*

Logical access is an essential control for information but access controls over the general IT environment are not sufficient to protect the spreadsheet information. Spreadsheets are often accessed and used via notebooks and removable electronic media such as Universal Serial Bus (USB) flash drives, compact discs (CD's) and digital video disks (DVD's). Employing cloud computing and wireless access particularly in public spaces e.g. in airport lounges, means that users need to adhere to the relevant privacy and security protocols.

As part of the control environment the organization should have policies in place that ensures that all personnel with access to or use of electronic information are aware of and take precautions against unauthorized access including

what is known as "shoulder surfing". An unauthorized person may have access via looking at the screen whilst it is in use and this may be accentuated by the availability of connections that achieve extremely fast data transfers in a very short space of time. All it takes is seconds of not attending to an open notebook for significant transfers of data to occur in any space. In addition, one should ensure that the hardware containing the spreadsheet information is also physically secured from both theft and damage. Another key control is the physical control over the preparation, use and accessibility of documentation.

7.5 Monitoring

Management need to evaluate whether all the components above are functioning effectively and that where there is an internal audit function that the board are aware of, and react appropriately to any internal audit reports relating to spreadsheet risk and ensure that corrective action is carried out.

8. Conclusion

The analogy of an iceberg is an apt conclusion as there is no guarantee that all risks will be addressed and history has unveiled a number of significant frauds and errors that have arisen during the lifecycle of Spreadsheets. What about those lying below the water line? What can management do to address these?

Management need to identify the ambit of the objectives for which they are responsible and relate those to Spreadsheets and should consider that there are risks of both fraud and error. Further, management should recognise that these risks can occur anywhere in the spreadsheet lifecycle and ascertain the people who could be in a position to commit fraud or error. In addition management should ensure that the control environment and control and monitoring activities are implemented in accordance with their risk appetite and their control philosophy and recognise that this is a continuous process.

In implementing the above management can be more assured that they are complying with their responsibilities for the governance of risk relating to spreadsheets and thereby reducing the likelihood of material and significant impacts on their organisations arising from intentional or unintentional errors and irregularities in the spreadsheet lifecycle.

References:

1. Barnes, J., Tufte, D. and Christensen, D. (2009). Spreadsheet Design: An Optimal Checklist for Accountants, *American Journal of Business Education*, Vol. 2, No. 9, pp. 117-130
2. Butler, R. (2001). Tackling the Subversive Spreadsheet, *IS Audit & Control Journal*, Vol. 5,

- 2001, available at <http://www.isaca.org/Journal/Past-Issues/2001/Volume-5/Pages/Tackling-the-Subversive-Spreadsheet.aspx?PF=1> Accessed 10 August 2012.
3. Butler, R. (2009). The Role of Spreadsheets in the Allied Irish Bank / Allfirst Currency Trading Fraud, available at <http://arxiv.org/ftp/arxiv/papers/0910/0910.2048.pdf> Accessed 6 August 2012.
 4. Caldwell, J. (2012). A Framework for Board Oversight of Enterprise Risk, *Canadian Institute of Chartered Accountants (CICA)*, Canada, pp.1-69.
 5. Castelluccio, M. (2012) COSO releases Framework for Public Comment, *Strategic Finance*, Vol.93, No.7, p.24
 6. Committee of Sponsoring Organisations of the Treadway Commission (COSO) (2013) Internal Control – Integrated Framework, *Executive Summary*, May 2013, pp.1-10
 7. Correia, C. & Minter, T (2011). The Role of Spreadsheet Model Design in Corporate Finance courses, *International Conference of Education, Research and Innovations*, ICERI2011 Proceedings, 14-16 November, 2011, Madrid, pp. 356-365
 8. Coster, N., Leon, L., Kalbers, L. and Abraham, D. (2011) Controls over Spreadsheets for Financial Reporting in Practice, *Proceedings of European Spreadsheet Risks Interest Group (EuSpRIG) 2011 Conference "Spreadsheet Governance – Policy and Practice"*, 12th Annual Conference, Greenwich, London, 1 July 2011.
 9. Ferreira, M. and Visser, J. (2012). Governance of Spreadsheets through Spreadsheet Change Reviews, Proceedings of European Spreadsheet Risks Interest Group (EuSpRIG) 2012 Conference "The Science of Spreadsheet Risk Management", 13th Annual Conference, Manchester, UK, 5-6 July 2012. <http://arxiv.org/pdf/1211.7100v1.pdf>
 10. Glater, J. (2003) Fannie Mae Corrects Mistakes in Results, *The New York Times*, Business Day, October 30, USA
 11. Goldman, J. & Ahuja, S. (2011) Integration of COBIT, Balanced Scorecard and SSE-CMM as an Organizational & Strategic Information Security Management (ISM) Framework in M. Quigley, (ed.), *ICT Ethics and Security in the 21st Century: New Developments and Applications* IGI-Global, Ch14, pp.277-309
 12. Grossman, T. Mehrotra, V. & Ozluk, O. (2006) Lessons from Mission Critical Spreadsheets, University of San Francisco School of Business and Management, Working Paper
 13. Institute of Directors in Southern Africa, (2009) The King Report on Governance for South Africa (King III), The Institute of Directors in Southern Africa, September 2009
 14. International Auditing and Assurance Standards Board (IAASB), (2010). Identifying and assessing the risks of material misstatement through understanding the entity and its environment. *International Standard on Auditing 315*. New York, NY: International Federation of Accountants
 15. International Auditing and Assurance Standards Board, (IAASB) (2011) The Evolving Nature of Financial Reporting; Disclosure and Its Audit Implications, Discussion paper, New York, NY: International Federation of Accountants, January 2011, pp.5-43
 16. International Accounting Standards Board (IASB) Conceptual framework for Financial Reporting, July 2011, IFRS Foundation, United Kingdom, pp.71-122
 17. Lemieux, V. (2008), Archiving: The Overlooked Spreadsheet Risk, arXiv:0803.3231v1 <http://arxiv.org/abs/0803.3231>
 18. Leon, L., Kalbers, L., Coster, N. and Abraham, D. (2012), A Spreadsheet Life Cycle Analysis and the impact of Sarbanes-Oxley, *Decision Support Systems*, Vol. 54, No.1, pp. 452-460.
 19. Nixon, D & Ohara, M. (2010) Spreadsheet Auditing Software, <http://arxiv.org/ftp/arxiv/papers/1001/1001.4293.pdf>. Accessed 9 August 2012
 20. Panko, R. (2006). Spreadsheets and Sarbanes-Oxley: Regulations, Risks and Control Frameworks, Xactly Corporation, USA.
 21. Panko, R. & Aurigemma, S. (2010). Revising the Panko–Halverson taxonomy of spreadsheet errors, *Decision Support Systems*, Vol.49, No. 2, pp.235-244
 22. Powell, S, Baker, K & Lawson B. (2008) A critical review of the literature on spreadsheet errors, *Decision Support Systems*, Vol. 46, No.1, pp.128–138
 23. Powell, S, Baker, K & Lawson B. (2009) Impact of errors in operational spreadsheets, *Decision Support Systems*, Vol. 47, No.2, pp.126–132
 24. The Auditor™. Automated spreadsheet auditing. Error & Risk resolution Fannie Mae makes billion dollar spreadsheet error overstating gains <http://www.auditor.com/HorrorStories.html> Accessed 9 August 2012
 25. Vemula, V, Ball, D & Thorne, S. (2008) Towards a Spreadsheet Engineering, *Arxiv preprint ArXiv: 0803.0159* <http://arxiv.org/ftp/arxiv/papers/0803/0803.0159.pdf>, 3 March 2008. Accessed 7 August 2012.