



**PRIFYSGOL CYMRU
THE UNIVERSITY OF WALES**

**Spreadsheet use for strategic decision-making: An analysis of
spreadsheet use and associated risk.**

Submitted by

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Abstract

Spreadsheets are the most widely used End User Computing (EUC) tool. Errors in spreadsheets are significant and well documented. There is anecdotal evidence that spreadsheets are used at strategic level. The conjunction of the extent of errors and spreadsheet use at a strategic level in organisations raises the risk exposure to organisations.

There are two approaches towards this problem: 'spreadsheet engineering' or 'business problem'. There is extensive research in finding spreadsheet engineering solutions to reduce the errors. This research instead followed a 'business problem' approach. The literature reviewed concerned various subject areas: general Risk Management, EUC and IT Risk Management. The conceptual framework developed suggested an approach to mitigate risks associated with spreadsheet use.

The study followed a pragmatist research philosophy using a combination of qualitative and quantitative methods. This research investigated the significance and extent of spreadsheet problems using a Questionnaire survey conducted with Tuck Business School, USA, along with four secondary studies and a qualitative analysis of an e-discussion by an expert forum of EUSpRIG. This was followed by two qualitative case studies using semi-structured interviews. Resulting from the case studies, a model was developed for categorising spreadsheet use incorporating risk. The categories of use and approach to measure the risk were defined.

This study concludes that spreadsheets are an integral part of the organisations and their strategic decision-making processes. Spreadsheets are a powerful tool and have been a victim of their own success. The answer is not to avoid spreadsheets but to use them more sensibly and carefully as one would do with any other powerful tool. There needs to be formalised control governing their use and development, based on their type of use and extent of risks associated. The model developed helps prioritise spreadsheets based on categories of use incorporating risk associated and suggested strategy for each category.

Dedication

This thesis is dedicated to my little angel

“AKSHARA”

Acknowledgements

During this doctoral research journey there are many people I would like to thank for their support, advice, guidance, encouragement and patience. I owe a lot of appreciation to each of these persons.

First of all, I would like to thank Mr Pat Cleary for his guidance and support throughout the research as my Director of Studies. I would also like to thank the others in my supervisory team Dr David Ball and Mr David Chadwick (University of Greenwich). It is because of their feedback and support that I have been able to complete the thesis.

I would like to thank UWIC Cardiff School of Management Director of Research Professor Eleri Jones for the support offered to all the researchers. Special thanks must go to the European Spreadsheets Risks Interest Group (EUSpRIG) community, for domain specific expert guidance and feedback to my papers and research approach. It was because of this community that I managed to have contact with Steven Powell and Barry Lawson from Tuck Business School, Dartmouth University, USA. This gave me the opportunity to do the quantitative research for this thesis. I have presented papers within this community in the past and the encouragement from the community has kept me going. I would also like to thank everyone at the UWIC Finance and Accommodation department for providing me access to conduct my interviews.

I would like to thank Dr. John Gunson, my friend and colleague, who was pivotal in encouraging me and keeping me focussed.

Last, but at the same time most importantly I would like to thank my family. Thanks to my mother and father for their blessings and constant support throughout the PhD journey. They have kept me on my toes and pushed me hard to finish this thesis. I must mention a special word for my wife, whose care and love gave me courage during my doctoral journey.

I could not have done it without you all.

Declaration

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree. This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by giving explicit references. A bibliography is appended.

I hereby give my consent for my thesis, if accepted, to be available for photocopying and inter library loan, and for the title and summary to be made available to outside organisations.

Signed..... (Mukul Madahar – Candidate)

Date.....

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Glossary of Acronyms

• ACTIA	<i>Australian Capital Territory Insurance Authority</i>
• AIRMIC	<i>The Association of Insurance and Risk Managers</i>
• ALARM	<i>The National Forum for Risk Management in the Public Sector</i>
• CEO	<i>Chief Executive Officer</i>
• CFO	<i>Chief Financial Officer</i>
• CIB	<i>Chartered Institute of Bankers</i>
• COSO	<i>Committee Of Sponsoring Organisations of the Treadway Commission</i>
• DP	<i>Data Processing</i>
• DSS	<i>Decision Support Systems</i>
• ERM	<i>Enterprise Risk Management</i>
• EUC	<i>End User Computing</i>
• EUSpRIG	<i>European Spreadsheet Risk Interest Group</i>
• HMCE	<i>Her Majesty's Customs and Excise</i>
• HMRC	<i>Her Majesty's Revenue and Customs</i>
• ICAEW	<i>Institute of Chartered Accountants in England and Wales</i>
• INFORMS	<i>Institute For Operations Research and Management Sciences</i>
• IOMA	<i>Institute Of Management and Administration</i>
• IOSH	<i>Institute of Occupational Safety and Health</i>
• IR	<i>Inland Revenue</i>
• IRM	<i>Institute of Risk Management</i>
• IT	<i>Information Technology</i>
• MIS	<i>Management Information System</i>
• NHS	<i>National Health Service</i>
• PERT	<i>Programme Evaluation and Review Technique</i>
• PWC	<i>Price Waterhouse Coopers</i>
• SDLC	<i>Software Development Life Cycle</i>
• SOX	<i>Sarbanes Oxley</i>
• UKAIS	<i>UK Association of Information Systems</i>
• UWIC	<i>University of Wales Institute Cardiff</i>
• VBA	<i>Visual Basic for Applications</i>

CHAPTER ONE

INTRODUCTION

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Chapter 1: Introduction

The purpose of this chapter is to set the scene for the study by highlighting the background, rationale, agenda, scope and broad research approach for the thesis. The major research questions along with the aim and objectives are discussed before ending the chapter with an overview of the layout of the thesis.

1.1 The Background:

The Oxford Dictionary (2010) defines a spreadsheet as:

***noun** a computer program used chiefly for accounting, in which figures arranged in a grid can be manipulated and used in calculations.*

The Britannica Online Encyclopaedia (2010) provides a much fuller definition, i.e.:

A computer program that represents information in a two-dimensional grid of data, along with formulas that relate the data. Historically, a spreadsheet is an accounting ledger page that shows various quantitative information useful for managing a business. Electronic spreadsheets all but replaced pen-and-ink versions by the end of the 20th century. Spreadsheets are not limited to financial data, however, and are frequently used to represent scientific data and to carry out computations.

The same source when searched for Management Information System (MIS), gives the following definitions:

*A computerized **information-processing system** designed to support the activities of company or organizational management.*

*In the 1960s, when computers were applied to the routine decision-making problems of managers, Management Information Systems (MIS) emerged. These systems **use the raw** (usually historical) **data from data-processing systems** to **prepare management summaries**, to chart information on trends and cycles, and to **monitor actual performance against plans or budgets**.*

The words marked in red are the key words in the definitions. It is clear that the basic function of an Information System is to accept data, manipulate that data and turn it into information used by management. When we consider spreadsheets, the same thing happens; we input raw data in a two-dimensional grid, add some formulae or manipulations and then produce information which is used by management.

Despite the similarity in the definitions of a Spreadsheet and a Management Information System it is noticed that when one approaches an organisation to develop a Management Information System, there are certain levels of standards, controls and methodologies that need to be followed. On the contrary it is noticed that spreadsheet models are developed by many individuals with no such control or regulations applied to them. Thus uncontrolled and unmonitored spreadsheet development and use can represent a significant risk to an organisation, just like uncontrolled and unmonitored MIS development and use. This risk may go unrecognised by many organisations.

When the researcher searched 'Google' for 'Spreadsheet Risk' the very first entry that appears is European Spreadsheets Risk Interest Group (EUSpRIG)

and this is then followed by many websites of organisations which offer services and tools for spreadsheet auditing, helping to get rid of errors within spreadsheets. The tools and add-ins are all more of a reactive approach to handling spreadsheet errors. The website of EUSpRIG highlights many examples of how minor errors within the spreadsheets ended up costing a lot of money to organisations (EUSpRIG, 2010). The range of organisations that have had problems due to spreadsheet errors are across the board, ranging from financial institutes, to government councils and multinationals to small organisations. The monetary amount of the discrepancy resulting from such errors was noticed to be in millions of dollars. One of the latest one was about the Barclays Capital – Lehman Brothers case, where the problem occurred due to a formatting error in an Excel spreadsheet (Computer World, 2008). The table below highlights some of the other examples:

Table: 1.1: Some examples of errors and its impact (Adapted from EUSpRIG (2010))

Company	Release date	Discrepancy amount/Risk
Nevada City	Jan-06	\$5 million: Delay in city budgeting process, embarrassment
Westpac	Nov-05	Around \$10 million: Public embarrassment, loss of investor confidence
Kodak	Nov-05	Around \$10 million : Loss of share value, investor confidence, career damage
Virginia Tech	May-05	Public embarrassment, adverse press coverage
Fannie Mae	Oct-03	\$1.2 billion: Loss of shareholder confidence
The Register (UK) OGC	Mar 06	Inaccurate choice of vendors for large government contracts, legal challenges, bad press

The extent of errors within spreadsheets is well researched. Panko (2005) in his paper summarises various studies and states that the error rate can vary somewhere between 30% - 100% (Refer Table 2.1 in Literature Review). It has been stated that on average 60% of the spreadsheet models developed contain errors (Panko, 2005).

1.2 Research Agenda and Research Questions

There is anecdotal evidence (through the above examples) that spreadsheets are used at a strategic level within organisations. The conjunction of the extent of errors in spreadsheets and their use for strategic decision-making raises the significance of risk exposure to the organisations. The author therefore decided to investigate this issue further. The first task on hand for this thesis was to explore the extent that spreadsheets are used for strategic decision-making and was the focus of the first research question. The research question relating to this task was:

- *To what extent are spreadsheets used in strategic decision-making?*

The purpose of this research question was three-fold:

1. Investigate whether spreadsheets are strategic to organisations.
2. Confirm that they are used directly for management decision making (at all levels of management).

3. Confirm that they directly or indirectly (by feeding information) contribute to the progress of the organisation.

Strategic decision-making in the context of this study is very much on the lines of the thoughts of White (2004, p5), who says that strategy is “*a coordinated series of actions which involve deployment of resources to which one has access for the achievement of a given purpose*”. Strategy according to him combines the “*articulation of human goals and the organisation of human activity to achieve these goals*”. The strategic decision-making, therefore, is about decisions which help achieve organisational objectives directly or feed information to help achieve objectives. These can be operational or management processes, for example, allocation of resources, maintaining and recording transactions, marketing research, financial analysis, evaluating alternatives, forecasting, budgeting, and corporate planning including investment decisions or mergers and acquisitions.

In order to address this question, the author investigated the extent of use of spreadsheets within organisations and the level of awareness of the risks associated with it. A quantitative survey was designed and administered in association with Tuck Business School, Dartmouth University, USA. Besides recommending other questions the author designed the section on ‘risk management’ within the questionnaire. In addition to the above survey, four studies carried out within the spreadsheet research group in UWIC, one of which was undertaken under the supervision of the author, were analysed. There was an online discussion on the expert forum of EUSpRIG. A qualitative

analysis of this discussion was also carried out in order to address the above research question.

Assuming that spreadsheets are used at a strategic level within organisations (outcome of the above research question) combined with the extent of errors in spreadsheets, it is evident that there is potentially a significant problem. Therefore the next task on hand was to investigate and develop a possible solution to this problem. Thorne (2009) mentions that this problem could be approached either through a business-driven agenda or a software engineering driven agenda. There is extensive research following spreadsheet engineering approaches (Thorne, 2009). The business-driven spreadsheet research could be led by risk. The author decided to approach this problem as a business problem, rather than a technical problem, as was the case for many organisations offering auditing tools and software add-ons.

The business-driven spreadsheet research agenda could be led by risk...establishing an acceptable system of assessing use and risk for spreadsheet applications and then developing strategies to deal with the identified risk...this could range from critical applications to trivial...Some significant progress...has been achieved through the work of Madahar et al. (2007, author's paper)...reaching a consensus on use and risk of spreadsheets is difficult and greatly needed. (Thorne, 2009 p8)

It is therefore a novel approach to spreadsheet error reduction. This led to the second research question:

- *What measures can be taken to secure Spreadsheet use as decision support tools?*

In order to address this question, it was decided to develop a model for categorisation of spreadsheet use within organisations incorporating risk, which would then be followed by developing risk mitigation strategies for each category. When the proposed study was presented in the UKAIS (UK Association of Information Systems) PhD Consortium in 2006, it was suggested to the author that the scope of the study was beyond a single investigation. This then led to focussing the scope and the aim and objectives of the study. The author therefore developed a model for categorisation of spreadsheet use incorporating the level of risk associated with them within organisations. Once this model is developed, applying this model in organisations and developing risk management strategy for each category would be further research post doctorally for the author.

1.3 Aim and Objectives

The aim and objectives of the study with the modified scope are:

AIM: To investigate the extent of spreadsheet use within strategic decision-making enabling an assessment of the significance of spreadsheet errors and risks associated with them and to develop a model to categorise spreadsheet use incorporating risk. The resultant model must be capable of being applied pragmatically in a range of organisations and should be understandable to technical and non-technical audiences.

This aim has been supported by the following objectives:

1. Critical review of relevant literature to develop a conceptual framework for mitigation of risks associated with spreadsheet use within strategic decision-making.
2. Investigate the level of spreadsheet use in strategic decision-making.
3. Investigate the use, importance and risks associated with spreadsheet within organisations and develop a model for categorising spreadsheet use incorporating risk.

1.4 Research Approach:

The research philosophy for this study was pragmatism. The approach followed within this study was a mixed-methods approach, i.e. combination of qualitative and quantitative methods. The approach for research question one was mainly quantitative and included qualitative analysis of the online discussion on the expert forum and for research question two it was mainly qualitative.

1.5 Overview of the thesis

The overall thesis has been divided into seven chapters.

Chapter 1 highlights the background to the study along with research agenda, aim and objectives of the study. This chapter sets the scene for the rest of the study.

Chapter 2 critically reviews the literature in various disciplines, such as risk management, Information Technology (IT), End User Computing (EUC) and spreadsheets. This chapter is to determine the extent of research in order to identify areas for novel research. (Objective One) A conceptual framework is developed with the help of the literature for mitigation of risks associated with spreadsheet use.

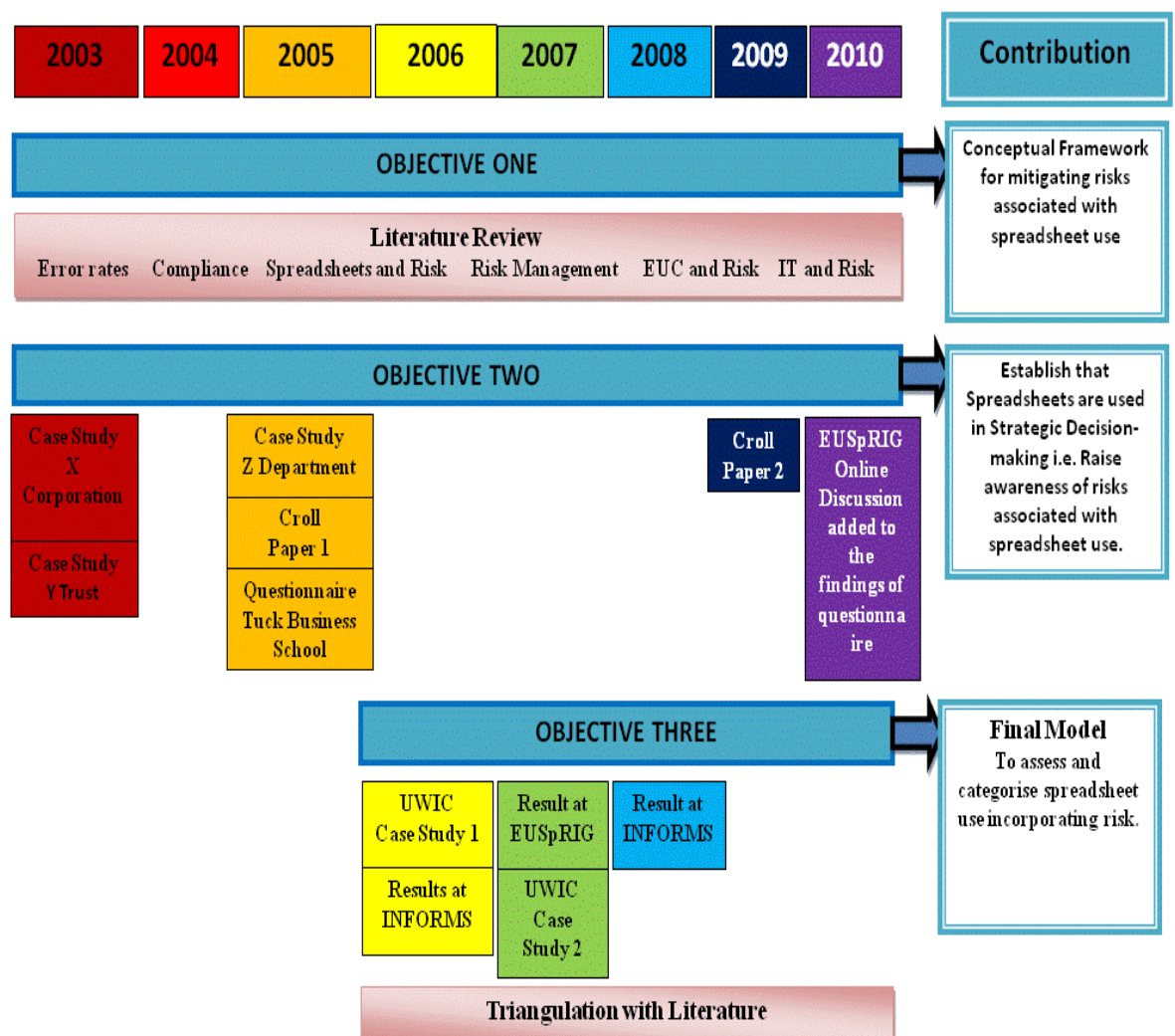
Chapter 3 discusses the research methodology followed for this study. The author adapts the research onion proposed by Saunders *et al.* (2007) to structure this chapter. The various methods adopted for data collection and analysis and their justification is discussed within this chapter.

Chapter 4 relates to research objective two of the research. It highlights the results of questionnaire survey conducted in collaboration with the Tuck Business School, Dartmouth University USA. It also discusses the findings of the three studies carried out either within or under the supervision of the spreadsheet research group in UWIC, along with a study carried by a senior member of EUSpRIG in London city. These studies complement the current study. Qualitative analysis of an online discussion on the EUSpRIG expert forum about the use of spreadsheets is also presented within this chapter.

Chapter 5 relates to objective three of the thesis. It discusses the results of the two case studies within UWIC and the developmental process of the categorisation model, moving from different proposed models to the final model. The chapter relates back and confirms some of the findings of objective two in previous chapter as well.

Chapter 6 then finally summarises the major findings, contributions of the thesis. The limitations and scope for further research are discussed in this chapter. Figure 1.1 highlights the timeline for the study which was conducted on a part-time basis over the period of 2003-2010.

Figure 1.1: Time line for the study



CHAPTER TWO

LITERATURE REVIEW

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Chapter 2: Literature Review

2.1 Introduction

Objective 1 of the thesis aims to undertake a:

Critical review of relevant literature to develop a conceptual framework for mitigation of risks associated with spreadsheet use within strategic decision-making.

This chapter will present the critical review of literature and determine the extent of the problems associated with spreadsheets. The chapter will open by highlighting spreadsheet problems. Once this has been highlighted, possible solutions will be investigated. The author looked at other streams such as general risk management, End User Computing (EUC), and Information Technology (IT) Risk Management. The purpose of discussing these areas is to see if any of these approaches can possibly be adapted for spreadsheet use. This eventually led on to development of a conceptual framework to help mitigate risks associated with spreadsheet use within strategic decision-making.

Another purpose of the chapter is to investigate various possible approaches used in the categorisation of risk in various streams and specifically spreadsheets, which would then assist with Objective 3: *To investigate use, importance and risks associated with spreadsheets within organisations and develop a model for categorising spreadsheet use incorporating risk.*

2.2 Spreadsheet Error

Curtis (1998, p48) places spreadsheets firmly in the end-user application group of Decision Support Systems (DSS) by saying that:

Of all the computerised productivity tools made available to the decision maker in business organisations over the last decade, the electronic spreadsheet is among the most powerful, widely employed and user friendly.

Curtis (1998) offers several reasons as to why this situation has arisen so readily in the business environment:

- Spreadsheets are a popular tool. In fact they are used in a wide range of general business-modeling tasks.
- Spreadsheets are easily applied to “what if” analysis.
- Spreadsheets can use input data from corporate databases and can feed data into these databases.
- Spreadsheets can be used to build data models without the need for technical computing skills.

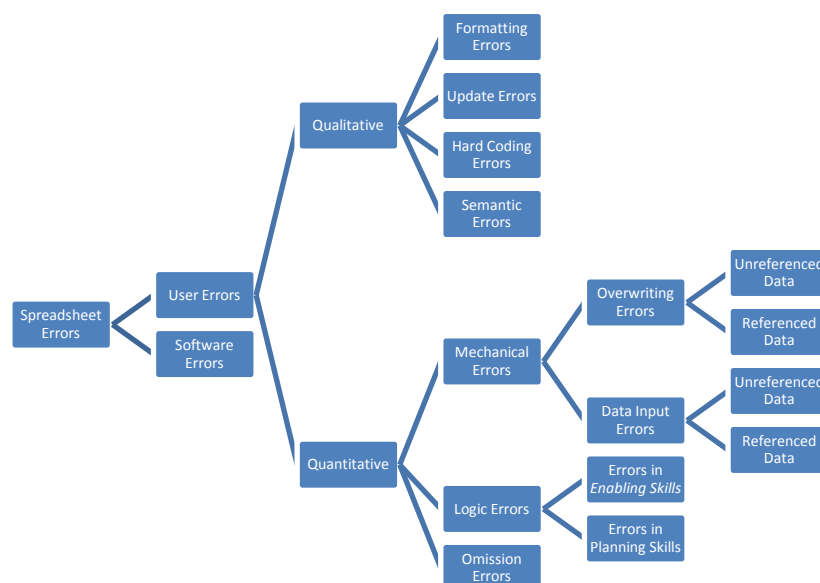
2.2.1 Types of Errors

When a spreadsheet gives an incorrect result it can be defined as a quantitative error. Qualitative errors occur during such activities as maintenance and ‘what if’ analysis. Qualitative errors may lead to quantitative errors as demonstrated by Teo and Tan (1997). Panko and Halverson (1996) also felt it was necessary to distinguish between three types of quantitative errors – mechanical, logic and

omission. According to them *mechanical* errors are simple mistakes, such as mistyping a number or pointing to wrong cell; *logical* errors involve entering the wrong formula because of mistake in reasoning; *omission* errors are when something is left out. On one hand it is pointed out by Panko (2005) that logical errors are the most difficult to find, Colver (2007) on the other hand says that omission errors are the most dangerous type.

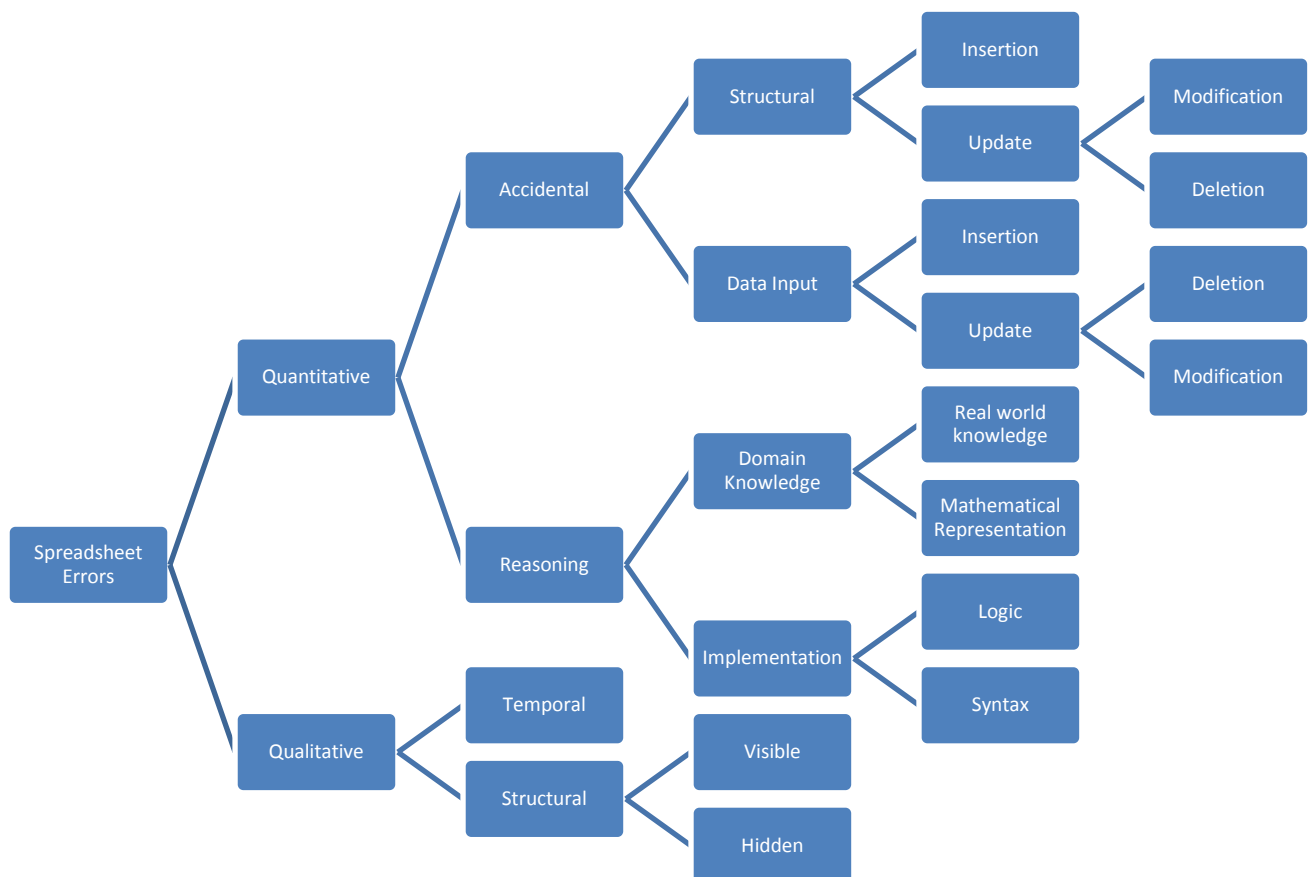
There have been attempts to develop *taxonomies* of spreadsheet errors (Rajalingham *et al.*, 2000; Rajalingham, 2005; Purser and Chadwick, 2006). The taxonomy developed by Rajalingham *et al.* (2000) (see figure 2.1 below) was influenced by Panko and Halverson (1998) and was represented in a decision tree structure.

Figure 2.1: Taxonomy of Spreadsheet errors (adapted from Rajalingham *et al.*, 2000, p26)



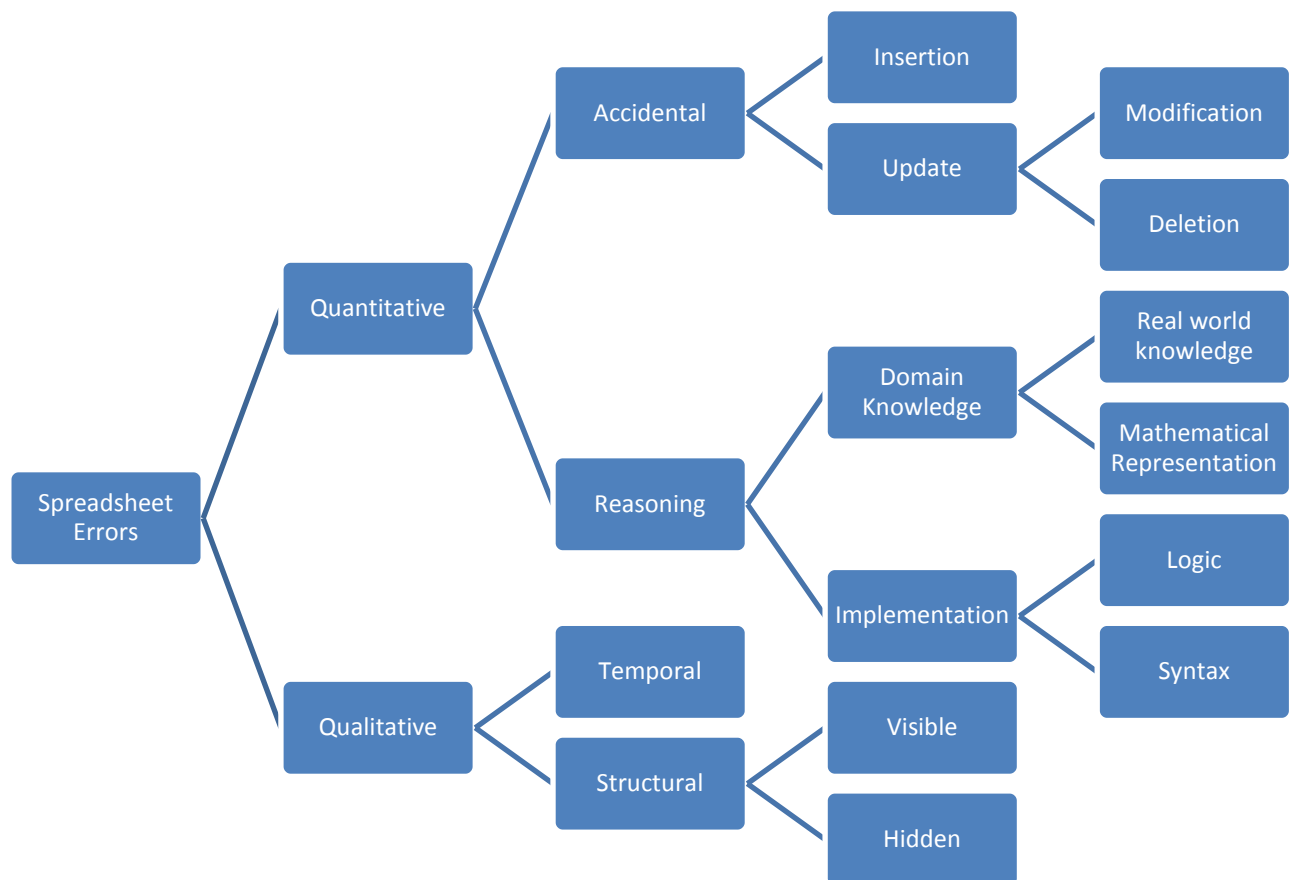
Rajalingham (2005, p187) when developing a revised taxonomy of spreadsheet errors, identified that the taxonomy above had certain limitations. According to him “it was difficult to navigate down the taxonomic tree to assign a specific error to a class. Also it was possible to place certain errors in two or more different classes, potentially resulting in ambiguous interpretation of errors”. In the new taxonomy Rajalingham (2005) followed a *binary* approach using *dichotomies* or division into two mutually-exclusive groups.

Figure 2.2: Modified Taxonomy of Spreadsheet errors (Rajalingham, 2005, p189).



Even within this taxonomy a certain crossover, was noticed by Purser and Chadwick (2006) who pointed out that: *“It could be argued that a potential data input error is actually caused by a structural error when the developer fails to create a robust structure (formula network) in the spreadsheet”* (p191). By removing this distinction between developer-created and end user errors, Purser and Chadwick (2006) removed the repetitiveness and mitigated the ambiguity of describing the error. Finally they came up with ten distinct finite classifications rather than thirteen classifications with two repeated groups.

Figure 2.3: Revision of Rajalingham’s (2005) classification by Purser and Chadwick (2006, p191)



2.2.2 Extent of Error

An Excel Error gives Barclays too much Lehman

Computer Weekly, October 2008

This was one of the headlines related to the largest bankruptcy case in US history, which occurred due to a formatting error in an Excel Spreadsheet, prompting a legal motion by Barclays Capital to amend its deal to buy some of the assets of Lehman Brothers. This is just one of the many cases where an error in a spreadsheet cost an organisation a lot of monetary/reputational losses (Computer Weekly, 2008). There are many more stories on the website of EUSpRIG ([.euspriq.org](http://euspriq.org)), which promotes discussion and research in the area of spreadsheets risk.

A KPMG survey (Chadwick, 2002) of financial models based on spreadsheets found that 95% of models contained major errors (errors that could affect decisions based on the results of the model), 59% of models were judged to have 'poor' design, 92% of those dealing with tax issues had significant tax errors and 75% had significant accounting errors. An article in *New Scientist* (Ward, 1997) reported that a study conducted by the British accounting firm Coopers & Lybrand found errors in 90% of the spreadsheets audited. This is a significantly high figure and if these errors had gone undetected it could have had a devastating effect on the business. More broadly, a number of consultants, based on practical experience, have said that 20% to 40% of all

spreadsheets contained errors (Panko, 1997). Freeman (1996) cites data from the experience of consulting firm, Coopers and Lybrand in England, which found that 90% of all spreadsheets with more than 150 rows that it audited contained errors. One Price-Waterhouse consultant audited four large spreadsheets and found 128 errors (Ditlea, 1987). According to Franz Hormann (1999) what makes matters worse is that many spreadsheets are templates, or models, to which users continually add information. If the original contains an error, each new data input amplifies that original error.

Panko and Ordway (2005) summarise all the studies (A mix of audits and experiments) that investigated the extent of spreadsheet errors into a table.

Table 2.1: Error Rates adapted from Panko and Ordway (2005, p55)

Authors	Year	%age of Spreadsheets with Errors	Comment
Davies & Ikin	1987	21%	Only serious errors were reported.
Cragg & King	1992	25%	
Butler	1992	11%	Only errors large enough to require additional tax payments
Dent	1994	30%	Errors caused by users hard-wiring numbers in formula cells. Henceforth, all future computations would be wrong.
Hicks	1995	100%	One omission error would have caused an error of more than a billion dollars.
Coopers & Lybrand	1997	91%	Off by at least 5% In accounting, such errors are material.
KPMG	1998	91%	Only significant errors that could lead to an incorrect decision.
Lukasic	1998	100%	In Model 2, the investment's value was overstated by 16%. Quite serious.
Butler	2000	86%	Only errors large enough to require additional tax payments
Clermont, Hanin, & Mittermeier	2002	100%	Computed on the basis of non-empty cells and so included text rather than just numbers and formulas.
Lawrence and Lee	2004	100%	30 most financially significant SSs audited by Mercer Finance & Risk Consulting in previous year.

The error rates highlighted in Figure 2.1 are significant. Bellinger (2005, p14) states that *"Once you think about it, I am sure you'll remember situations in which you believe your spreadsheets are error-free: but you wouldn't want to go into a witness box and swear to it"*. He further adds, *"I know every time I go back to an old spreadsheet, I tend to take one look at it and decide that it's easier to do it again rather than try to unravel my last heroic effort"*. Ray Butler (2000, p73) of the Computer Audit Unit, Customs and Excise, who, for over ten years, had been investigating errors in spreadsheets used by companies for calculating their VAT payments, says that, *"The presence of a spreadsheet application in an accounting system can subvert all the controls in all other parts of that system"*. On the other hand Chadwick (2002, p2) highlights in his paper that David Finch, Head of Internal Audit at Superdrug plc, believed:

The use of spreadsheets in business is a little like Christmas for children. They are too excited to get on with the game to read or think about the 'rules', which are generally boring and not sexy.

Further David Finch thinks that we should not be too surprised at the high rate of spreadsheet errors as end user computing is inherently a high-risk area. Most aspects, especially those where responsibility clearly lies with the IT function, tend to be well controlled as the disciplines surrounding client/user or mainframe environments tend to be transported through to the IT function to provide solutions. However, Finch believes that control is often much weaker where powerful analysis tools are given to less disciplined users. He is quite frank about what he believes is the cause of the phenomenon.

There is often little control over end user developments in spreadsheets with little if any standardisation in development processes by users in different departments, little risk analysis and a general assumption that models, on which important business decisions are made, are accurate. Users who are technically capable of developing applications have not been trained in development methodology.

(Chadwick, 2002, p2)

Estimates are that each error costs between £5000 and £50,000 a month. On this basis one can assume that corporate Britain is losing up to £1 billion a year: *“If we could make a 10% improvement in accuracy through training we could generate £10 million a year in value”* (Bellinger, 2005, p14).

Vowler (2000) stresses that over-reliance on spreadsheets as a business intelligence tool is dangerous — they are not designed for large, complex applications, especially where data has to be shared and stored reliably. There is no point in an IT development trying to ban spreadsheets. Users love them too much. They will ignore bans and the software IT tries to replace spreadsheets with.

Inference for the study: Errors within spreadsheets are well documented. Once used mainly for simple functions, such as logging, tracking and totalling information, spreadsheets with enhanced formulas are being used for complex calculative models. There have been several attempts to develop taxonomy of spreadsheet errors. However there seems to be no one classification that is universally accepted although the one that was given by Panko and Halverson (1998) seems to be the simplest and easiest to apply. The extent of errors

within spreadsheets is significantly high. The extent of errors varies, but it is clear that the majority (on average over 60%) of spreadsheets contain errors. If we assume that spreadsheets are being used in strategic decision-making (which is the focus of Objective 2 of this study) then there seems to be a significant problem, which needs to be addressed. This study is a step in this direction.

2.3 Compliance and Spreadsheet

The importance that banks and other financial institutions place on information security and IT governance is documented in an annual survey by Delloite & Touche. The 2007 Global Security Survey found that of the 169 financial institutions polled, 98 percent of them said that they were spending more on the information security this year than the previous year (Community Banker, December 2007).

In a report published by Institute of Management and Administration (IOMA, 2004, p11), it is highlighted that:

All of a sudden – thanks to Enron and a few other accounting geniuses – corporations everywhere are worried that their internal controls may not be adequate. Credit managers who are being asked to certify their departments' work now have to be concerned about the spreadsheets commonly used in their day-to-day work. Their flexibility and ease of use has to be balanced against the needs of top managers to certify the accuracy and reliability of spreadsheet based information.

In order to find this balance, many professionals have to review and refine the controls that affect spreadsheets, just as they have to review the controls affecting other tools and processes that produce information for significant accounts and disclosures.

Cleary *et al.* (2005) in their discussion paper in EUSpRIG Conference in 2005 highlighted the key legislation, regulations and the implications of errors in spreadsheets on the organisation and the stakeholders of the organisation(s) that are affected. Furthermore, organisations are under increased scrutiny from industry regulators to prove that they have adequate controls around critical EUC applications and that they themselves are free from errors (FINRA, 2010).

2.3.1 Sarbanes Oxley (SOX) Act and Spreadsheets:

SOX is the latest legislation that is raising concerns within organisations, especially financial reporting corporations. According to Baxter (2005, p97), while the specific requirements of each piece of regulation might be open to interpretation, the overall direction is clear: *“to ensure that businesses understand what is happening in their organisation; to be able to respond to the possibility of things going wrong in the first place; and, most personally, to hold the business and its key executives to account if they do not do it”*.

Baxter (2005) highlights four sections most relevant to spreadsheets and their controls (Refer Table 2.2):

Table 2.2: SOX and Spreadsheets: Baxter (2005, p98-99)

Section	Requirements	Spreadsheet Implications
103 Auditing, Quality control, and independence standards	Independent auditors must include an evaluation of the Company's internal controls in their report. The evaluation will include a description of material weaknesses in internal controls and material non-compliance with them	Un-monitored spreadsheets in the critical information supply chains will fail this test.
302 Corporate responsibility for financial reports	Executives must evaluate the effectiveness of internal controls every quarter. Financial reports must include their conclusions about internal controls and explain any significant changes to them. All frauds, no matter how small, must be disclosed to the Company's auditors and to the Audit Committee of the Company's Board of Directors.	It may be possible to eliminate spreadsheets temporarily but unlikely they can be eliminated for every quarterly report. Spreadsheets are also a common source of fraud.
304 Forfeiture of certain bonuses and profits	Accounting restatements due to material non-compliance of the Company with reporting requirements of securities laws, and that are the result of misconduct, could result in the Executives having to reimburse the Company for their bonuses, or for any profits they realise from the sale of the Company securities.	Spreadsheet errors have been the source of material financial mis-filings that would result in triggering this clause.
404 Management assessment of internal controls	The SEC requires that the annual report contain an internal control report, which: • States management's responsibility for establishing and maintaining an adequate internal control structure and procedures for financial reporting; and, • Assesses, as of the end of the most recent fiscal year of the Company, the effectiveness of the internal control structure and the procedures for financial reporting. The Company's auditor is required to attest to and report on management's assessment of internal controls.	Un-monitored spreadsheets in the critical information supply chains will fail this test and are likely to result in qualified statements of control.

The concerns for spreadsheets highlighted above clearly indicate weaknesses in spreadsheets. Baxter (2005, p99) states:

- *They are highly vulnerable to error and, occasionally, fraud.*
- *The information they contain and the user interaction with them are not transparent to the rest of the organisation.*
- *It takes significant time and effort to understand unexpected changes and to respond and communicate them as appropriate.*

The requirements of SOX enhance focus on control environment. The management needs to have specific control activities to evaluate the significant spreadsheets. The feasibility of developing multiple linked spreadsheets using macros allows users to build very complex models, usually with minimal or no documentation. These spreadsheets are not subjected to same control environment as other information systems formally acquired or purchased (PWC, 2004). For example, the developers and users of spreadsheets are usually not trained in structured programming, testing, version control or systems development methodologies, and spreadsheets are rarely restricted from unauthorised access by security controls.

The Institute of Management and Administration (IOMA, 2004, p12) highlights the approach developed by Price Waterhouse Coopers (PWC) that managers can use to evaluate the controls that exist for their spreadsheets. This is a five step approach:

1. Inventory your spreadsheet: The organisations should inventory all spreadsheets used to support significant processes. Steps in this process should develop information such as:
 - a. *Name of the spreadsheet*
 - b. *Brief description of the spreadsheet and the financial amounts calculated;*

- c. *Department responsible for the “development” of the spreadsheet, as well as any other departments that utilises the spreadsheet; and*
- d. *Frequency and extent to the changes in the spreadsheet.*

2. Evaluate the use and complexity of each spreadsheet
3. Determine the necessary level of controls for each spreadsheet
4. Evaluate existing controls for each spreadsheet: and address any gaps between necessary and existing controls
5. Developing an action plan for fixing control deficiencies

2.3.2 Controls assisting Compliance within spreadsheets:

There are two sets of controls highlighted by PWC (2004), which assist in compliance within spreadsheets.

The first set of controls is associated with *data protection issues*. The means of maintaining change control is by maintaining a controlled process for requesting changes to a spreadsheet, making changes and then testing the spreadsheet, and obtaining formal sign-off from an individual that the change is functioning as intended. The means of maintaining version control is to ensure that only current and approved versions of spreadsheets are used by creating naming conventions and directory structures. The means of maintaining access control (e.g. create, read, update, delete) is to limit access at the file level to a spreadsheet on a central server and assign appropriate rights. To restrict

access, controllers can also password protect files. The means to maintain input control is to make sure that reconciliation occurs. This step ensures that data is inputted completely and accurately. To maintain security and integrity the organisations could implement a process to ensure that data embedded in spreadsheets is current and secure. Make sure cells are locked or protected to prevent inadvertent or intentional changes to standing data.

The second set of controls is associated with *physical security issues*. The first means to assure this would be to ensure that there is an appropriate level of documentation and that it is up to date. Other means include having backups for the spreadsheets regularly, making sure that historical files are no longer available for updates i.e. archiving them and locking them as read only.

Inference for the study: More recently (due to cases like ENRON!) organisations have been willing to listen to research proposals when compliance issues have been mentioned. Concern with liability under SOX and similar legislation and regulation seems to be concentrating minds, especially where corporate liability is concerned. Many organisations now are investing both interest and resources to make themselves SOX compliant. The spreadsheets being highly vulnerable to errors can be one of the big impediments for organisations to be fully compliant. The information on most of the spreadsheets is usually not transparent to the rest of the organisation, thereby causing further problems. This further adds onto the importance of the problem highlighted in section 2.2.

2.4 Spreadsheets and Risk

Spreadsheets are vital to many organizations but their limitations mean they should not be allowed to become too important.

Charles Batchelor, Financial Times (December, 2010, p2)

Chris Randles (2005, p24) states that, *“virtually any powerful tool can wreak havoc when misused, whether it's nuclear energy, an automobile, a hammer, or, yes, office software ... such as spreadsheets”*. As a result they introduce significant errors often disguised by the interface itself. Miscalculations can often result in wastage of time, reputation and money. Nigel Rayner (2010, p1), an analyst from Gartner Research, in an interview with Financial Times, says that *“from a strategic perspective, most CFOs (Chief Financial Officer) are woefully inadequate because they are still trying to deliver these capabilities (referring to reporting to tax authorities and investors, keeping accounts correct and managing cash flows) using Excel spreadsheets”*. When asked why this is done, he says that, *“sometimes it is a cultural issue, a familiarity issue and a skills issue... they have always done it that way...they are not aware of how technology market has developed”*. It is said that the situation is not going to change in the near future, as *“business and finance education does not address these issues”*.

There is an overlooked (below the waterline) iceberg of problems in end-user computing. Spreadsheets are developed by people who are very skilled in their main functional responsibilities, i.e. finance, procurement, or production planning, but often have had no formal training in spreadsheet use. Information Technology (IT) auditors focus on mainstream information systems but regard

spreadsheets as user problems, which are outside their concerns. Internal auditors review processes, but not the tools that support decision-making in these processes. Lemon and Ferguson (2010, p16) highlight that: *“like any other area of risk, it usually requires something to go wrong for the right people to take notice and for something to be done”*.

As highlighted by Systems Modelling Ltd. (2003, p1) the questions that need to be raised are:

Are any important decisions made in your company supported by spreadsheets? Have these models been tested or reviewed? Do you have internal standards for spreadsheet development? We all know that people make mistakes. Yet end users and their managers have the confident belief that their work is perfect!!

The approach towards spreadsheet risks seems to be very similar to the approach towards general risk in the 1970s (to be discussed later), which was little discussed and its effects on businesses were ignored, because they were not recognised, or possibly concealed.

Frequently, the chief aim of spreadsheet applications is to provide information upon which decisions can be made. Hammod *et al.* (1995, 292) investigated the relationship between computer based DSS (primarily spreadsheets) and management decisions. The conclusions were that:

- *“These systems significantly influenced the time taken to arrive at a decision”*

- *“The quality of the decisions made was directly influenced by the quality of the information provided and the interpretation of the information.”*

From this, it can be inferred that design faults and errors with the spreadsheets would affect the quality of information therein and so adversely affect the validity of any interpretation of the information and decisions based on them. It would be difficult not to conclude that the decision-making ability of management would not be adversely affected by errors in the design and data structure of the subject spreadsheet. Financial Times (December 8, 2010, p2) in an article titled, *“A tool that is too ad hoc and open to error”*, quotes Andrew Meade, UK Head of Finance and Performance Management for Accenture, *“Many of the problems blamed on spreadsheets are often the result of human error ... so it often is a business problem but the spreadsheet does not help”*.

In the words of Pemberton and Robson (2000, p386):

To some extent, the spreadsheet has been a victim of its own success. Spreadsheet software designers have succeeded in developing an informal and user-friendly computing environment in which data presentation and analysis can be undertaken with relative ease.

Inference for the study: The inference is very much in line with thoughts reflected by Systems Modelling Ltd. (2003). One needs to investigate if decisions made in the organisation are supported by spreadsheets. If this is the case then, check whether they are tested and reviewed and if there are any internal standards for the spreadsheet development. It is common that human

beings make mistakes yet the level of confidence carried by developers in the models developed is very high. The general approach towards risks associated with spreadsheets is usually ignored, because they are not recognised, or possibly concealed. The first and the foremost task, therefore, is to raise awareness of spreadsheet risks, so that they are addressed along with the mainstream risk management for the organisation. One cannot mitigate a risk, of which one is not aware. The research into spreadsheet modellers and overconfidence by Panko (2003) reveals that 80-100% of the modellers who were confident in the quality of work produced, made mistakes. Croll (2009) further highlights that, because spreadsheet users do not go looking for errors, they do not find any or many. Spreadsheet users are therefore overconfident in their use of spreadsheets. The work of Croll (2005; 2009) is very much in line with the Objective 2 of this thesis, so it will be discussed in an independent section in Chapter 4, where the author will discuss spreadsheet use within organisations.

Discussion within this section clearly indicates another aspect: the spreadsheet problem is really an organisational problem (including the human tendency to make mistakes and errors) rather than a technical problem. This discussion clearly highlights the importance and necessity of having some form of framework to manage spreadsheet use within the organisation.

2.5 Approaches to the categorisation of spreadsheets (Use/Complexity)

PWC (2004, p2) classify spreadsheets based on two separate criteria.

The first categorisation is based on the uses of information contained in spreadsheets:

- Operational: *“Spreadsheets used to facilitate tracking and monitoring of workflow to support operational processes, such as a listing of open claims, unpaid invoices and other information that previously would have been retained in manual, paper file folders.”* These may be used to monitor and control that financial transactions are captured accurately and completely.
- Analytical/Management Information: *“Spreadsheets used to support analytical review and management decision-making.”* These may be used to evaluate the reasonableness of financial amounts.
- Financial: *“Spreadsheets used to directly determine financial statement transaction amounts or balances that are populated into the general ledger and/or financial statements.”*

The second categorisation is based on the complexity of spreadsheets (p2):

- Low complexity: Spreadsheets which serve as an electronic logging and information tracking system.
- Moderate complexity: Spreadsheets which perform simple calculations such as using formulas to total certain fields or calculate new values by multiplying two cells. These spreadsheets can be used as methods to translate or reformat information, often for analytical review and analysis, for recording journal entries or for making a financial statement disclosure.
- High complexity: Spreadsheets which support complex calculations, valuations and modelling tools. These could be considered as applications or software programs in their own right.

It is imperative, therefore, that proper management of end user development is in place where user designed and developed spreadsheets form part of the decision support chain. During a research programme involving 34 case studies of public and private sector organisations 30 were found to be using spreadsheets as an EUC tool (PWC, 2004).

Pemberton and Robson (2000) conducted a survey about the extent and type of usage of spreadsheets within organisations. The sample selected for the survey consisted of the part-time students at the University of Northumbria, Newcastle-Upon-Tyne, UK. They found that spreadsheets are clearly in widespread use across all functional areas and all job grades, with just 10% making no use of

spreadsheets at all. They classified spreadsheets on the basis of application areas (refer Table 2.3).

Table 2.3: Classification of Spreadsheets based on application areas (Pemberton and Robson, 2000, p385)

Area of Application	Specific Use
Financial	Profit and loss analysis Job costing and invoices Cashflow analysis and budgeting Fixed asset schedules Material costing
Workload Planning	Staff rotas Time sheets and analysis of workloads Holiday and sickness log Timetables Work schedules
Quality Control	Stock sheets Inventory recording Inspection sheets
General Administration	Storage of debit notes Preparation of Board reports Payroll analysis
Forecasting	Income projections Trend analysis Production planning Business planning

Inference for the study: There have been several attempts to categorise risks in general and also spreadsheet use within organisations. But there has been no attempt to categorise spreadsheet use within organisations integrating the risks associated with it. Therefore this study shall make a novel attempt to develop such a categorisation model. The above sections have clearly identified the problem of spreadsheet use within strategic decision-making. Now the following sections shall assist in development of a conceptual framework to mitigate these risks. This is done by looking at other disciplines to assess whether any of these approaches can be adapted for spreadsheets.

2.6 RISK

The revolutionary idea that defines the boundary between modern times and the past is the mastery of risk: the notion that the future is more than a whim of the gods and that men and women are not passive before nature.

Bernstein (1998, p8)

According to Bernstein (1998) the word “risk” derives from the early Italian *risicare*, which means “to dare.” According to Kedar (1970 cited Merna and Al-Thani, 2008) the origin of the word ‘risk’ is thought to be either the Arabic word *risq* or the Latin word *riscum*, which refers to anything given to you by God from which you draw profits. The Latin *riscum*, however, originally referred to the challenge that barrier reef presents to the sailor and clearly has connotations of an equally fortuitous but unfavourable event.

Merna and Al-Thani (2008) further add that the modern French word *risqué* has mainly negative but occasionally positive connotations, for example in ‘*qui ne risqué rien n’a rien*’ or ‘nothing ventured nothing gained’, whilst in common English usage (the word entered the English usage in the mid-seventeenth century) the word ‘risk’ has very definite negative associations as in ‘run the risk’ or ‘at risk’, meaning exposed to danger (Merna and Al-Thani, 2008).

The modern conception of risk is rooted in the Hindu – Arabic numbering system that reached the West seven to eight hundred years ago. But the serious study of risk began during the Renaissance, when people broke loose from the constraints of the past and subjected long-held beliefs to open challenge. Chevalier de Méré, a French nobleman, with a taste of gambling and

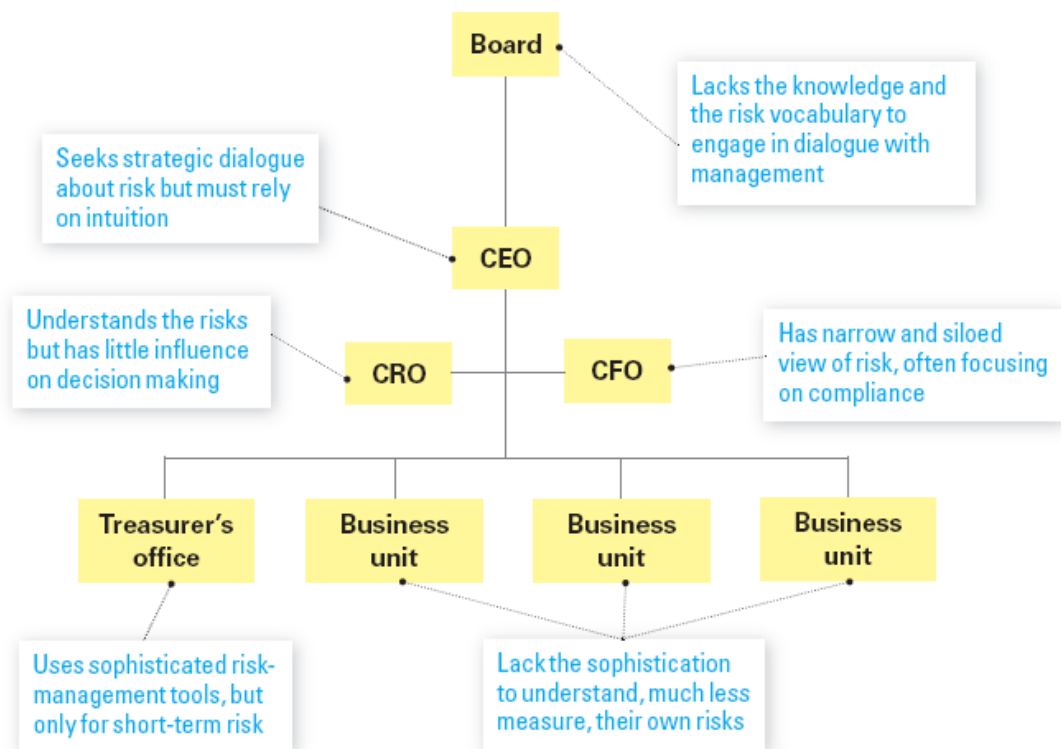
mathematics, challenged the famed French mathematician Blaise Pascal to solve a puzzle (about how to divide the stakes of an unfinished game of chance between two players when one of them is ahead), which was posed by monk Luca Paccioli. Pascal turned for help to Pierre de Fermat, a lawyer who was also a brilliant mathematician. It was this collaborative thinking that developed into the discovery of the theory of probability, the mathematical heart of the concept of risk. People could therefore for the first time take decisions and forecast the future with the help of numbers. Risk management guides us over a vast range of decision making, from allocating wealth to safeguarding public health, from waging war to planning a family, from paying insurance premiums to wearing a seatbelt, from planting corn to marketing cornflakes (Bernstein, 1998).

Over time and in common usage the meaning of the word has changed from one of simply describing an unintended or unexpected outcome, good or bad, of a decision or course of action to one which relates to undesirable outcomes and the chance of their occurrence (Wharton, 1992).

Despite having its roots many years ago, risk was not much discussed until the 1970s with the advent of project risk management (Merna and Al-Thani, 2008). Risk management has undoubtedly become an important part of prudent project and business management, but it is still not always easy to justify. The benefits it generates are often unseen, while the costs are all too visible (Wightman,

1998 cited Merna and Al-Thani, 2008). The figure below highlights the general risk culture in most companies.

Figure 2.4: Risk Culture in most companies: (Buehler et al, 2008, p108)



Beuhler *et al.* (2008) highlight through the above model that the approach towards risk management in most organisations is fragmented. Being the key link between the organisation and the board, the CEO (Chief Executive Officer) ends up relying more on intuition. They clearly highlight that “*without strong risk-analysis processes, most companies gravitate toward one of the extremes: overexposure or over-insurance.*” (p109). Organisations should have a strong

risk culture informing decisions at all levels and should concentrate on long-term benefits rather than short-term performance.

2.6.1 Risk Management

While it's futile to try to eliminate risk, and questionable to try to minimise it, it is essential risks taken be the right risks.

Peter Drucker (1975 cited Pressman (2000, p161)

According to Kollar (2007), risk managers are confronted today with the challenges of identifying, assessing, prioritising, controlling, financing and monitoring risks across the enterprise. Before we can identify the “*right risks*” (i.e. assess and prioritise risks) to be taken, it is important to identify all risks that are obvious to both managers and practitioners.

Any definition of risk is likely to carry an element of subjectivity, depending upon the nature of the risk and to what it is applied (Riabokon, 2004). As such there is no all-encompassing definition of risk. Chicken & Posner (1998, p7) acknowledge this, and instead provide their interpretation of what a risk constitutes:

Risk = Hazard x Exposure

They define hazard as “... *the way in which a thing or situation can cause harm,*” and exposure as “... *The extent to which the likely recipient of the harm can be influenced by the hazard*”. Harm is taken to imply injury, damage, loss of

performance and finances, whilst exposure imbues the notions of frequency and probability.

The Royal Society (1983 cited Adams, 2004, p8) view risk as the probability *“...that a particular adverse event occurs during a stated period of time, or results from a particular challenge”* and also states that *“as a probability in the sense of statistical theory, risk obeys all the formal laws of combining probabilities”*. Hertz & Thomas (1984, p27) have suggested that *“... Risk means uncertainty and the results of uncertainty...risk refers to a lack of predictability about problem structure, outcomes or consequences in a decision or planning situation.”* Smith (1999) defines risk as a decision expressed by a range of possible outcomes with attached probabilities. When there is a range of possible outcomes but no assumed probabilities, there is only uncertainty.

Charette (1989), in his book on risk analysis and management, presents three conceptual underpinnings for risk:

- Firstly risk concerns future happenings. Today and yesterday are beyond active concern, as we are already reaping what was previously sowed by our past actions. The question is, can we, therefore, by changing our actions today, create an opportunity for a different and hopefully better situation for ourselves tomorrow.
- Secondly, this means, that risk involves change, such as in changes of mind, opinion, actions, or places.

- Thirdly, risk involves choice and the uncertainty that choice itself entails. Thus paradoxically, risk, like death and taxes, is one of the few certainties of life.

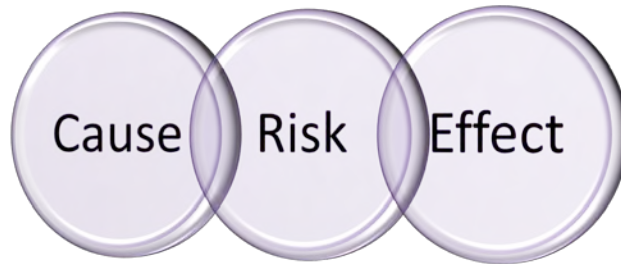
The Chartered Institute of Bankers (CIB) (1998, p23) further highlights that, *“The extent to which risk management is an art or a science, or indeed a judicious mixture of both, could form the subject of inconclusive debate”*. The key for anyone within an organisation is to be a businessman in a broader sense, coping with risks associated with managing business enterprise in a rapidly evolving market place. In terms of Credit Risk within banks, Brooks (1998 cited CIB, 1998) identifies four stages in the management of risk:

- Identify; areas where risk can arise.
- Measure; the degree of risk.
- Agreement on the level of risk; to be undertaken.
- Management of the business to the agreed level of risk.

2.6.2 Risk Analysis

Collins *New English Dictionary* defines analysis as *“the division of a physical or abstract whole into its constituent parts to examine or determine their relationship”*. Prof. Gordon C A Dickson (2003) identifies three basic stages of risk analysis as highlighted in Figure 2.5.

Figure 2.5: Various Stages of Risk Analysis (Adapted from Dickson, 2003, p1)



Dickson highlighted that every risk is caused by some factor/factors and results in some effect/effects. He visualised it as a chain, where the cause was linked to the nature of risk and the risk itself linked to the effect. This includes the looking for the causes, not yet known, and is not limited to identifying those things which we know can cause loss. The next link being between the causes and risk will need careful and rigorous analysis to ensure all known causes of risk are highlighted. The third link is about evaluating the impact of risk on an organisation. As a part of the final link we must ensure that all effects are identified, not just the ones that have previously occurred.

According to the Risk Management Standard published by IRM (The Institute of Risk Management), AIRMIC (The Association of Insurance and Risk Managers) and ALARM (The National Forum for Risk Management in the Public Sector) in 2002, Risk Analysis is defined as, *“The systematic use of information to identify sources and to estimate the risk”* (p7). This analysis is then considered to be a three-fold process (similar to the one suggested by Prof. Dickson, earlier) of risk identification (including the causes), risk description (including the risks) and

risk estimation (evaluating the effects). Risk Identification (Causes) is about identifying organisation's exposure to uncertainty. This needs an intimate knowledge of the organisation and the market in which it operates, the legal, social, political and cultural environment in which it exists, as well as the development of a sound understanding of its strategic and operational objectives, including factors critical to its success and the threats and opportunities related to these objectives.

This standard identifies one of the ways of classifying the business activities as below:

- Strategic – concerning long-term strategic objectives. These can be affected by capital availability, sovereign and political risks, legal and regulatory changes, reputation and changes in the physical environment.
- Operational – These concern day-to-day issues that the organisation is confronted with as it strives to deliver its strategic objectives.
- Financial – Concerns effective management and control of the finances and effects of external factors such as availability of credit, foreign exchange rates, interest rate movement and other exposures.
- Knowledge Management – concerns effective management and control of knowledge resources, the production, protection and communication thereof.
- Compliance – Concern issues as health & safety, environmental, trade description, consumer protection, data protection, employment practices and regulatory issues.

One key observation made within the standard is that, “*In-house ‘ownership’ of the Risk Management process is essential*” (p7). All the above activities need to be covered for identification of the relevant risks or causes of risks.

The process that follows Risk Identification is Risk Description. The purpose of this stage is to display the identified risks in a structured format. The use of a well designed structure is necessary to ensure a comprehensive risk identification, description and assessment process. One possible way is by using the Table 2.4 below:

Table 2.4: Detailed Risk Description (IRM, 2010, p5)

1	Name or title of risk	Unique identifier or risk index
2	Scope of risk	Scope of risk and details of possible events, including description of the events, their size, type and number
3	Nature of risk	Classification of risk, timescale of potential impact and description as hazard, opportunity or uncertainty
4	Stakeholders	Stakeholders, both internal and external, and their expectations
5	Risk evaluation	Likelihood and magnitude of event and possible impact or consequences should the risk materialise at current level
6	Loss experience	Previous incidents and prior loss experience of events related to the risk
7	Risk tolerance, appetite or attitude	- Loss potential and anticipated financial impact of the risk - Target for control of risk and desired level of performance - Risk attitude, appetite, tolerance or limits for the risk
8	Risk response, treatment and controls	- Existing control mechanisms and activities - Level of confidence in existing controls - Procedures for monitoring and review of risk performance
9	Potential for risk improvement	- Potential for cost-effective risk improvement or modification - Recommendations and deadlines for implementation - Responsibility for implementing any improvements
10	Strategy and policy developments	- Responsibility for developing strategy related to the risk - Responsibility for auditing compliance with controls

The final stage of risk analysis, i.e. Risk Estimation, can be quantitative, semi-quantitative or qualitative in terms of probability of occurrence and the possible consequence. Measurement can be in terms of Consequence or Probability of Occurrence. It can be a 3X3 matrix using High-Medium-Low in terms of consequence (both threat and opportunities) and **High (Probable) – Medium (Possible) – Low (Remote)** in terms of probability of occurrence. This is discussed further in the next section.

2.6.3 Practical Approaches to Risk

There are many aspects of business in which daily risk decisions need to be made, from computer systems to employees to information. There is consensus in literature about the sequence to be followed for risk management. The main steps identified and adapted from various sources (Broome, 2008; Muzzy, 2008; Loghry and Veach, 2009; ACTIA, 2004; Ernst & Young, 2008; Walker and Shenkir, 2008; ICAEW, 2002; IOSH, 2002; London Travel Watch, 2009; US Department of Energy, 2008; Cardiff Council, 2004; Suffolk County Council, 2007; Northern Ireland Government; 2005) are:

- Identifying or recognising risks
- Categorise the risks
- Assess and prioritize them
- Devising a plan to mitigate these risks
- Executing the plan.
- Monitoring the plan

Buehler *et al.* (2008b) in the Harvard Business Review highlight the risk management process as a cycle (see Figure 2.6 below).

Figure 2.6: Risk Management Process: (Buehler et al, 2008, p105)



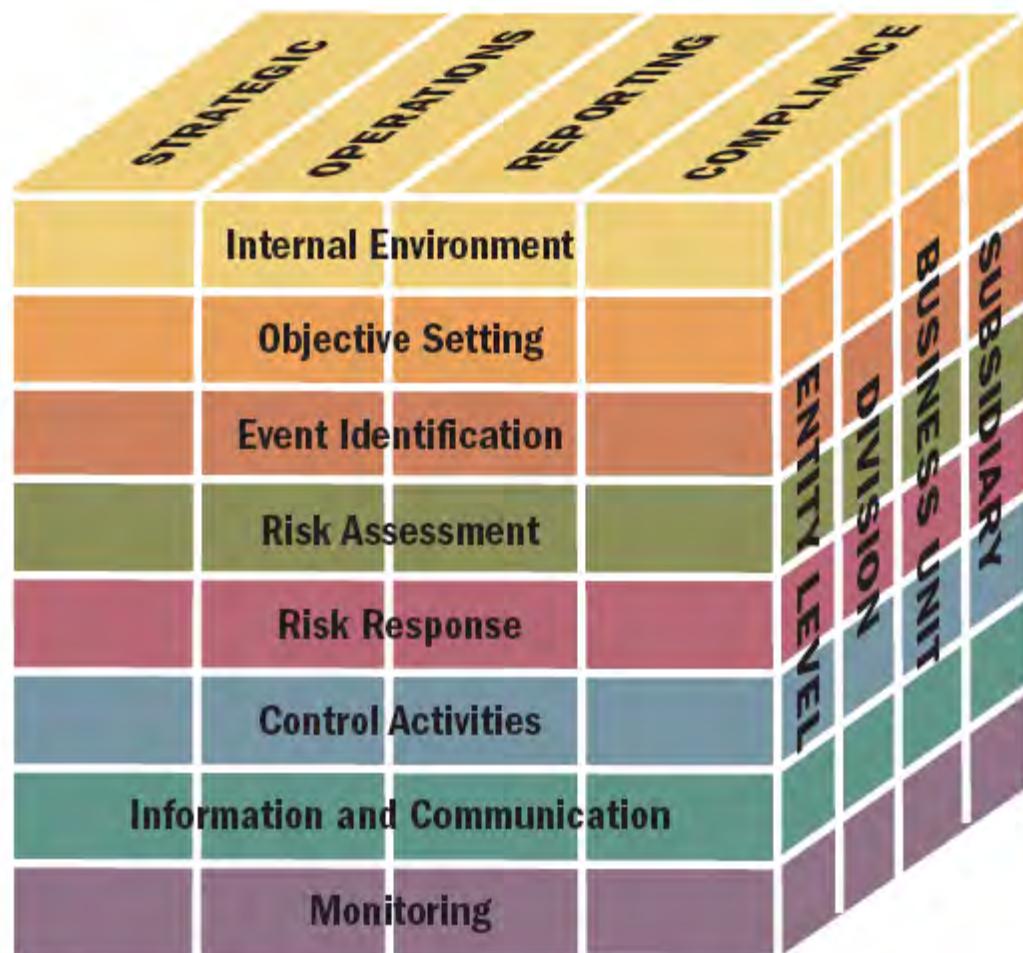
COSO (Committee Of Sponsoring Organisations of the Treadway Commission) (April, 2008, p50) highlight eight components of the Enterprise Risk Management (ERM):

1. Internal Environment: This encompasses the tone of an organisation and includes the perception and approach towards risk by the people of the organisation. In other words, the risk appetite, philosophy, ethical values and the environment.
2. Objective Setting: This needs to be done before identifying specific risks. These should support and align with the entity's mission and be consistent with the risk appetite.
3. Event Identification: Internal and external events effecting achievement of the objectives need to be identified, distinguishing between the positive and the negatives.
4. Risk Assessment: Risks are analysed, considering likelihood and impact.
5. Risk Response: The management needs to make a choice whether to avoid, accept, reduce or share the risk.
6. Control Activities: Policies and procedures put in place to make sure that the responses are carried out.
7. Information and Communication: Relevant information is identified, captured, and communicated in a form and time frame to enable individuals to carry out their responsibilities. Effective communications is needed on a broader sense, flowing both horizontally and vertically within the organisation.

8. Monitoring: The entirety of ERM is monitored and modifications made as necessary.

It is observed that these eight components are also in line with the steps identified above. The key aspect identified by COSO is communication, which is critical in effective implementation of the plan.

Figure 2.7: COSO ERM Framework: (Paladino, 2008, p28)



The most common standard followed is to put likelihood on a three/five point scale and then also put impact on a three/five point scale and generate a two-dimensional risk matrix. Then once you multiply the two scales, you get the risk score. Organisations keeping a Risk Register should record the following information:

- Risk description: Should give clear explanation of risk.
- Risk Owner: Should be preferably single identifiable person rather than committee or group.
- Controls and Control Status (Red/Amber/Green): Actions taken to reduce likelihood of risk occurring, to limit its adverse consequences, or to maximise opportunities. This should highlight the key actions or systems already in place. The Control Status can then highlight the effectiveness of these actions, whether they are working (Green), are in danger of failing or circumstances are changing (Amber) or are not working and need to be changed. (Red)
- Impact (1-3/5) and Likelihood (1-3/5)
- Overall risk Score: Impact X Likelihood

(Loghry and Veach, 2009; Australian Capital Territory Insurance Authority (ACTIA), 2004; ICAEW, 2002; IOSH, 2002; London Travel Watch, 2009; US Department of Energy, 2008; Cardiff Council, 2004; Suffolk County Council, 2007; Northern Ireland Government, 2005).

Figure 2.8: Measuring and Classifying Risk: Adapted from Loghry and Veach (2009, p35)

Likelihood	Consequences				
	5	4	3	2	1
5	Severe	Severe	High	Major	Significant
4	Severe	High	Major	Significant	Moderate
3	High	Major	Significant	Moderate	Low
2	Major	Significant	Moderate	Low	Trivial
1	Significant	Moderate	Low	Trivial	Trivial

Inference specific to the study: There is no one specific definition of risk. The very first step in risk management is to identify the risk. The two key constituents of risk are *Hazard* and *Exposure*. This can be measured using two variables, i.e. Likelihood (which measures the Probability) and the Impact. This can be done by adopting a 3-point or 5-point scale and the multiple of this produces the overall score. Based on the score one can classify the risk. Often one can only mitigate risk not completely eliminate it. Risk Management is not just a top-level analysis. Risk is inherent in every decision, and a risk-aware company requires some assessment of it in every decision that managers take. The key steps involved in Risk Management Process are: identifying and recognizing risk, categorizing risk, assessing and prioritizing risk, devising a plan to mitigate risks, executing the plan and finally monitoring the plan.

2.7 IT and Risk

Risk management encompasses three processes: risk assessment, risk mitigation, and evaluation and assessment (Stoneburner *et al.*, 2002). Risk management is the process that allows IT Managers to balance the operational and economic costs of protective measures and achieve gains in mission capability by protecting the IT systems and data that support their organizations' missions. This process is not unique to the IT environment; indeed it pervades decision-making in all areas of our daily lives.

Minimizing negative impact on an organization and the need for a sound basis in decision-making are the fundamental reasons organizations implement a risk management process for their IT systems. Effective risk management must be totally integrated into the Software Development Life Cycle (SDLC). An IT system's SDLC has five phases: initiation, development or acquisition, implementation, operation or maintenance, and disposal. In some cases, an IT system may occupy several of these phases at the same time. However, the risk management methodology is the same regardless of the SDLC phase for which the assessment is being conducted. Risk management is an iterative process that can be performed during each major phase of the SDLC (Stoneburner *et al.*, 2001).

Risk mitigation, the second process of risk management, involves prioritizing, evaluating, and implementing the appropriate risk-reducing controls recommended from the risk assessment process. Risk mitigation is a

systematic methodology used by senior management to reduce mission risk. Risk mitigation can be achieved through any of the following risk mitigation options:

- **Risk Assumption:** To accept the potential risk and continue operating the IT system
- **Risk Avoidance:** To avoid the risk by eliminating the risk cause and/or consequence (e.g., add controls that prevent the risk from occurring, remove certain functions of the system, or shut down the system when risks are identified)
- **Risk Limitation:** To limit the risk by implementing controls that minimize the adverse impact of a threat's exercising vulnerability (e.g., use of supporting, preventive, detective controls) or by authorizing operation for a limited time during which additional risk mitigation by other means is being put into place
- **Risk Transference:** To transfer the risk by using other options to compensate for the loss, such as purchasing insurance.

IRM (2010), Stoneburner *et al.* (2002) and Jordan (2005).

Inference for the study: Risk Management should be an integral part of the development process and should be incorporated at every stage of IT system'(s) development. The key options for risk mitigation are Assumption, Avoidance, Limitation or Transference.

2.8 EUC and Risk

To err is human. To really foul things up requires a computer.

Anon

Computers have permeated into entire organizations due to decentralization of the MIS function. Strategies, now a days, go beyond mainframe acquisition and include end-user based technologies (Alavi et al., 1988). EUC is a rapidly growing and irreversible phenomenon. The major advantages attributed to EUC include: *“enhanced productivity of professional and white-collar workers, overcoming the shortage of Data Processing (DP) professionals, provision of user friendly and responsive systems”* (p29). Davis (1982) mentions that in their enthusiasm to benefit from EUC activities, corporations are overlooking the potential risks of these activities. Organizational exposure to EUC risks is costly. In order to minimize the cost, the potential risks of EUC should be identified and managed. This is even more important because, most of the end-user developed and operated applications are not personal and private in nature, i.e. they are not merely used by a single individual to support his/her activities. In a study highlighted by Alavi and Weiss (1986) more than half of the systems surveyed concerned applications relevant to the operations of entire departments. Seventeen percent of the systems involved multiple departments and multiple functions. They further highlight a few key points about the risks associated with EUC:

- Often the end-user has not been formally trained in applying the system analysis techniques needed to adequately perform these activities.
- End-user applications are developed with little or no analyst involvement.
- The development process usually does not include documentation (which is typically viewed as a waste of time), formal validation procedures and extensive testing.
- They are not data processing professionals, rather corporate planners, financial analysts, or market researchers.
- An inherent characteristic of end-user developed applications is that they are easy to change, and often these changes are frequent, undocumented and not thoroughly tested.

Although EUC can improve an organisation's effectiveness, its resistance to control keeps it from bringing the expected benefits and often results in wasted investment (Chang and Shen, 1997). The breadth of impact of these end-user systems necessitates comprehensive and extensive management review and control procedures (risk management strategy). The purpose of the control procedures should not be to discourage EUC, but to guide, direct and encourage its effective use.

EUC sometimes uses fourth-generation tools and very powerful software packages to meet business requirements. Thus EUC can bring the following three benefits to companies (Alter, 1999):

- Improved end users' requirements determination, and more accurate determination of business requirements;
- Increase in end-users' involvement and satisfaction, boost in work autonomy;
- Reduction in application systems backlog, decreased dependence on information professionals.

Although EUC is a powerful asset for the future, with expectations for benefits to be confirmed by end-users, development with no control and no direction will bring about short- and long-term risks (Canning, 1983; Galletta and Hufnagel, 1992).

Chang and Shen (1997), based on investigations of Alavi and Weiss (1986), Amroso (1988), Brown and Bostorm (1989; 1994), Henderson and Treacy (1986) and Pyburn (1986-7), have categorized each type of EUC problem and risk as shown in Table 2.5:

Table 2.5: Risks and problems with EUC (Adapted from Chang and Shen (1997, p8))

EUC Infrastructure	Support	Technological	Data	Evaluation/ justification and Planning
Problems and risks confronting EUC	Lack of education for end-user; Lack of support for end-user	Database not easy to access; Incompatible soft/hardware; Poor documentation; Lack of documentation; Not suited for system analysis and design; Use of wrong software and tools; Solving wrong problems	Lack of data security; Lack of data integrity; Incompatible data	Lack of top management planning; Top management afraid of computers; Lack of recognizable economic benefits

For organisations to benefit from the phenomenon and activity of EUC, top management and or information departments must invest in strategic planning and evaluation, along with EUC support service, creating control policies and process management. The risks and problems associated with the EUC are similar problems that are being found in spreadsheet use.

Furthermore Bostrom and Brown (1989) state that it is not surprising if one subscribes to the assumption that the development of business applications by end users is an organisational innovation. That is, if EUC is an organisational innovation, organisational learning is required in order to formulate a strategy for the management of EUC, and many organisations are at an early point on that learning curve. Chang and Shen (1997) highlight that for organisations to benefit from the phenomenon and activity of EUC, top management or information departments must invest in strategic planning and evaluation, and

even in EUC support service, creating control policies and process management to prevent the evolution of potential 'white elephants'. Some of the key approaches for managing EUC are discussed below.

Laissez-faire Strategy: In this strategy the drive to increase the EUC control is low as interest in the EUC activity is low. This from an organisational perspective is a "hands – off" posture. Therefore this strategy lacks organisational procedures for either promoting or containing EUC activities. It is a do-nothing approach and a wait-and-see attitude toward EUC (Alavi *et al.*, 1988).

Monopolist Strategy: This strategy is about maintaining firm control on the EUC activities in order to slow down the growth rate of EUC. A central organisational entity, such as the MIS department, should control all information processing within the organisation. Control is therefore very high following a monopolistic strategy (Alavi *et al.*, 1988).

Acceleration Strategy: This is opposite to the monopolistic strategy and also referred to as an expansionist or implementation approach. This is to increase the EUC activities, which is accomplished through provision of support and training (Munro *et al.*, 1988). In fact, in a successful acceleration strategy, it may become increasingly difficult to adequately respond to the needs of the growing end-user population and meet the demands for support and training in a timely fashion with minimal formal controls (Alavi *et al.*, 1988).

Marketing Strategy: This strategy is one of directed growth, which is based on formal policies and planning in a specific direction. This involves a combination of centralised, as well as decentralised (departmental) support groups. The central group maintains a global perspective of the EUC activities by providing training and support to the decentralised departmental groups. Furthermore the central group ensures that an appropriate framework for EUC policy and control is established. The potential disadvantage of this strategy is that it can easily revert to the acceleration strategy if the central drive for guiding EUC activities and manipulation of demand is weak and disorganised. The control mechanisms within this strategy are not very restrictive.

Operations-based Strategy: This strategy perceives information as an organisational resource, which needs to be planned for, controlled and allocated amongst the users. This is a high-control strategy. Application development and operations control (e.g., development methodologies and documentation standards) ensure the quality, efficiency, coordination, and integration of EUC activities. These controls are enforced and maintained through scheduled and ad hoc audits and reviews. The audit and review teams stay abreast of EUC activities in the organisation and ensure that the policies, plans, and standards are adapted and appropriately followed (Alavi *et al.*, 1988).

Managed free economy approach: Gerrity and Rockart (1986) argued that previous EUC management methods, such as monopolist, laissez-faire and

information centre, all have drawbacks. They proposed a new management approach which is similar to the planned free economy approach in economics. This concept uses more of evolving management method for EUC, but lacks implementation methodology for how to use a planning approach to reach EUC objectives.

All these management models are based on information centre-based thinking about growth and control of EUC in the organisation. They lack totality and integrated solutions for addressing EUC problems and risks.

2.8.1 EUC Risk Framework

The benefits of user-developed systems are significant. However, there are serious risks in user-developed applications from errors and omissions in requirements, design, and quality assurance. Some of the risks exist in traditional application development but are enlarged in the end-user environment. Major reasons for the dangers and risks with end-user computing highlighted by Davis (1987) are:

- **The combination of the functions of user and system analyst.** It is not sufficient to merely build and use information applications; the applications must support organisational objectives, and they must meet a level of quality and completeness that is appropriate to the organisational unit and the decision or the activity using the information.

Standards and practices include documentation, controls, testing, interfaces with other systems, etc.

- **The limits on user ability to identify correct and complete requirements and appropriate solution procedures for applications.**

The errors in designing are more crucial than use of an application system, as they will influence for a longer period of time. The most frequent problem faced is the difficulty by users in identifying a correct and complete set of requirements and assessing the appropriate solution. This difficulty stems from human cognitive limits and errors in decision-making about requirements and solutions.

- **The lack of user knowledge and acceptance of quality assurance procedures for development and operation of applications.** There are risks from user-developed applications caused by lack of user knowledge and acceptance of organisational quality assurance procedures (if they exist). This is usually observed in new users as they underestimate the probability of errors and thereby neglect the quality assurance and testing procedures.

- **Unstable applications in organisational situations requiring stable systems.** An unstable information systems application is one that changes frequently at unpredictable times. User ability to change systems easily may result in too frequent changes. Dangers from unstable information systems occur only when the applications are used by or affect other functions. This risk is bigger if the system is used widely.

- **The risk from individual systems.** By definition, a user developed system is an individual system unless it is officially made available after appropriate organisational quality assurance along with relevant documentation. The user-developed system, by encouraging individual systems, encourages information hiding by individuals and further makes it difficult to transfer information applications to new persons taking over a position.

End-user applications tend to be used for the analysis of problem situations and in support of decision-making. These situations and decisions supported by the applications may range from ones having minor impact on the organisation to situations having major impact. For example, a minor analysis might be a model which examines mileage, travel or postage expenses. On the other hand, an analysis supporting a major investment decision or financial forecasting are decisions having major impacts on profitability and survival. Taking into account both the scope of use and the impact of the problem situation or decision, the level of quality assurance and control will vary from very little to major quality procedures.

Figure 2.9: Need for Separate Quality Control Procedure: Davis (1987, p73)

Need for Separate Quality Control Procedure			
Impact of Decision Supported by Analysis	Who Will Use Application		
	Developer Use Only	Small Functional Group Use	Extended Organization Use
Minor Impact Decision	None	Low	Medium
Medium Impact Decision	Low	Medium	High
Major Impact Decision	Medium	High	Major

The first and the foremost task while establishing EUC control and review procedures is to firstly identify potential risks associated with different facets of EUC. Alavi and Weiss (1986) highlight the various risks associated with different stages of end-user applications life cycle. The risks displayed are the most common to those end-users that design, program, and operate their own applications.

Table 2.6: Risks Associated with different stages of EUC Development Cycle (Alavi and Weiss, 1987, p7)

	End-user Application Life-cycle Stages	Organisational Risks
Analysis	Analysis of End-user tools	Ineffective use of monetary resources Incompatible end user tools Threats to Data security and integrity
	Analysis of End-user applications	Over-analysis and inefficient search in the problem space Solving the wrong problem
Design	Conceptual design of end-user applications	Applying the wrong model Mismatch between the tools and applications
	Development of end-user applications	Little or no documentation Lack of extensive testing Lack of validation and quality assurance checks Inefficient expenditure of non-DP personnel time Redundant development effort
Implementation	Operation of end-user applications	Threats to data integrity Threats to security Taxing the mainframe computer resources
	Maintenance of end-user applications	Failure to document and test the modifications Failure to upgrade applications

Often the end-user has not been formally trained in applying the system analysis techniques this in turn leads to inefficient search and analysis approaches. Furthermore, due to the availability of the end-user computing tools, work with the computer may become a substitute for hard and good thinking about the problem.

Alavi and Weiss (1987) further highlight that mistakes in the conceptual design of end-user applications can be very costly in that the applications may affect decisions and activities over a period of time. User designed systems seem to be more susceptible to modelling errors (which is similar to the errors mentioned by Panko earlier) because users typically lack specialised training and relevant experience. To make the problem worse the process does not include documentation (which is typically viewed as a waste of time and an unnecessary activity), formal validation procedures (which ensure that output of the system is accurate, complete, valid and credible), and extensive testing (which is considered very time consuming). The developers and users significantly underestimate the possibilities of errors and hence discount the need for and value of extensive testing (Davis, 1982). Furthermore, poor operating procedures and control coupled with user friendliness make end-user operated applications particularly vulnerable to security threats.

EUC applications are unstable due to frequent, undocumented and non thoroughly tested changes. These increase the likelihood of introducing errors

and may affect the inputs required and the outputs generated by the system. This in turn affects not just the integrity of these systems but also make it difficult to maintain such systems.

2.8.2 EUC Control Structures

Organisations presently find themselves in a paradoxical position. Any rigid controls on the EUC activity will be viewed as an attack on employee and professional productivity. At the same time letting function without any controls will potentially lead to many of the risks outlined. Therefore, the organisations need to think about the control framework very carefully. Even more important is the way this policy is introduced and implemented within organisations.

Risks may be thought of as just a financial loss. It will be negligence on the part of top management not to implement appropriate controls. It is therefore evident that management needs to take the initiative to control the EUC environment. By control, it does not mean to impede but rather to carefully plan for the expanded, productive use of EUC. There are three distinct control types which need to be addressed:

- Preventive Controls are about putting in place policies, procedures, and authorisation structures, such as training, data handling and back-up procedures and job descriptions.

- Detective Controls are about enforcing policies related to preventive controls, such as edit and validation checks, review of changes and restricting access.
- Corrective Controls are about providing to correct violations detected, such as password changing, discharging personnel.

According to Alavi and Weiss (1987) the greatest opportunities lie within the preventive control framework. They propose an 'EUC Control Framework' (refer to Figure 2.10).

Figure 2.10: An EUC Control Framework by Alavi and Weiss (1987, p13)

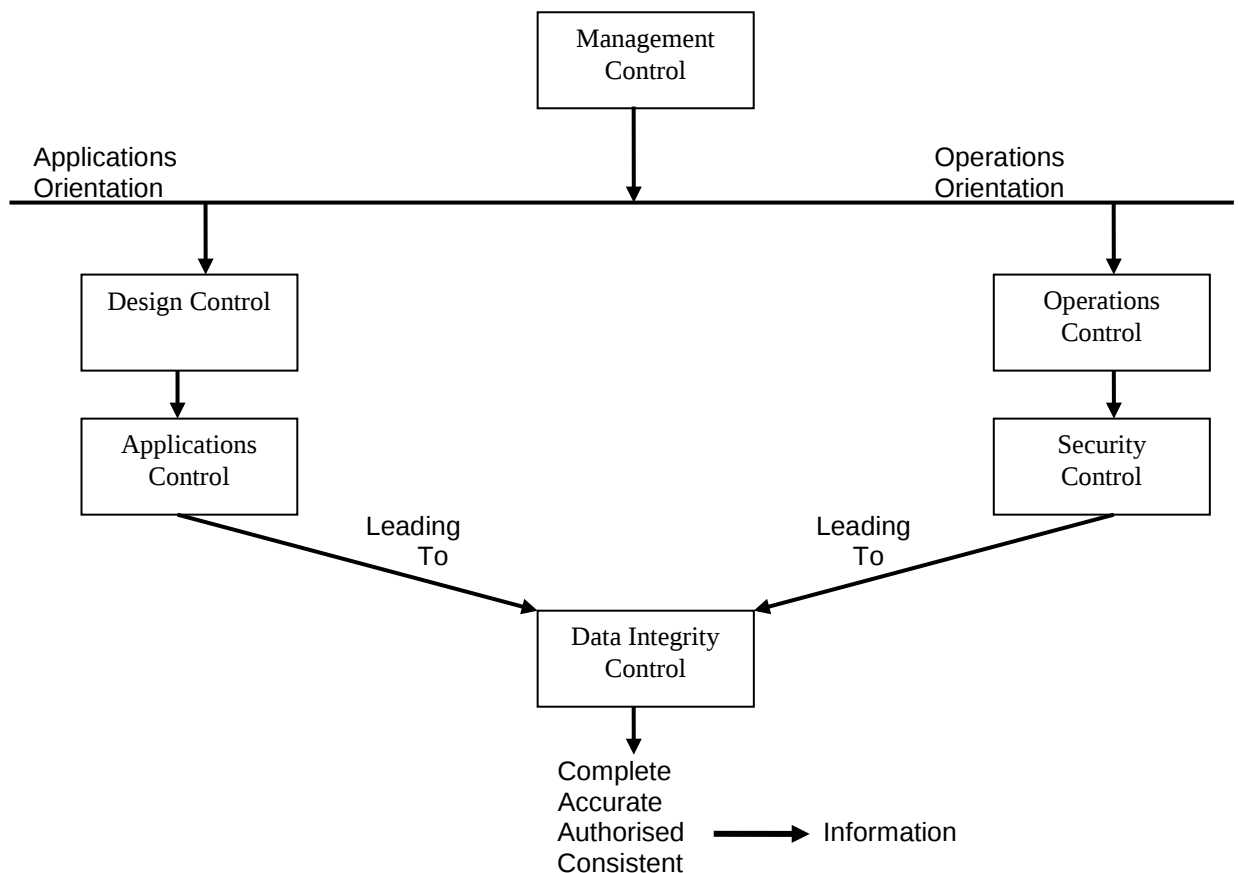


Figure 2.10 above highlights the relationship between the Control Mechanisms and the Organisational Risks associated with the Life Cycle stages of End-User Applications, proposed by Alavi and Weiss (1987)

Gordon B. Davis (1987) suggests some methods for minimising risks from user-developed system. He suggests that methods to minimise risk should not inhibit experimentation with EUC systems. Rather, they can provide mechanisms for organisational controls to assure user developed systems will be appropriate. These controls are related to implementation of organisational policy of implementing quality assurance evaluation to end-user based applications based on organisational impact of the decision or activity supported. They are also about providing training related to problem formulation and requirements analysis. The organisations can also select software that includes automatic documentation procedures and quality assurance procedures.

These mechanisms allow organisations to innovate through user developed applications but aid in obtaining a reasonable quality of results at an acceptable level of organisational risk.

Inference for the study: EUC is rapidly growing and irreversible phenomenon. End-user applications tend to be used for analysis of problem situations and in support of decision making. One of the main advantages of EUC is enhanced productivity of professional and white-collar workers, thereby overcoming the shortage of data processing professionals. Due to lack of system development

knowledge this can lead to potential risks as end users are likely to undertake inefficient search and analysis approaches. These applications usually do not contain documentation (typically viewed as waste of time), validation and testing. These applications are easy to change which is done frequently; once again with no documentation or testing. The risks potentially develop from errors and omissions in requirements, design and quality assurance (which is similar to the Spreadsheet problems discussed earlier in the chapter). The organisations find themselves in paradoxical position as they cannot really rigidly control such development and at the same time cannot open gates to allow such development at all levels. Therefore a well thought-out organisation wide control framework is needed.

The above discussion very much resonates with the example of Kings (The Domain Experts/The End Users) and Prophets (The IS Experts or the System Analysts) in the book, '*The Empty Raincoat*', by Charles Handy's (1995, p18).

He says:

There are Kings and Prophets, I was always told; said Tony Benn, the British socialist politician. 'The Kings have the power and the Prophets have the principles'. I am on the side of Kings, the people who make things happen, but every King needs his Prophet, to help him, and increasingly her, keep a clear head amidst the confusions. No one, however, would want the prophet to run the show... The Prophets can provide the chart but cannot dictate where and how the vessel should sail'.

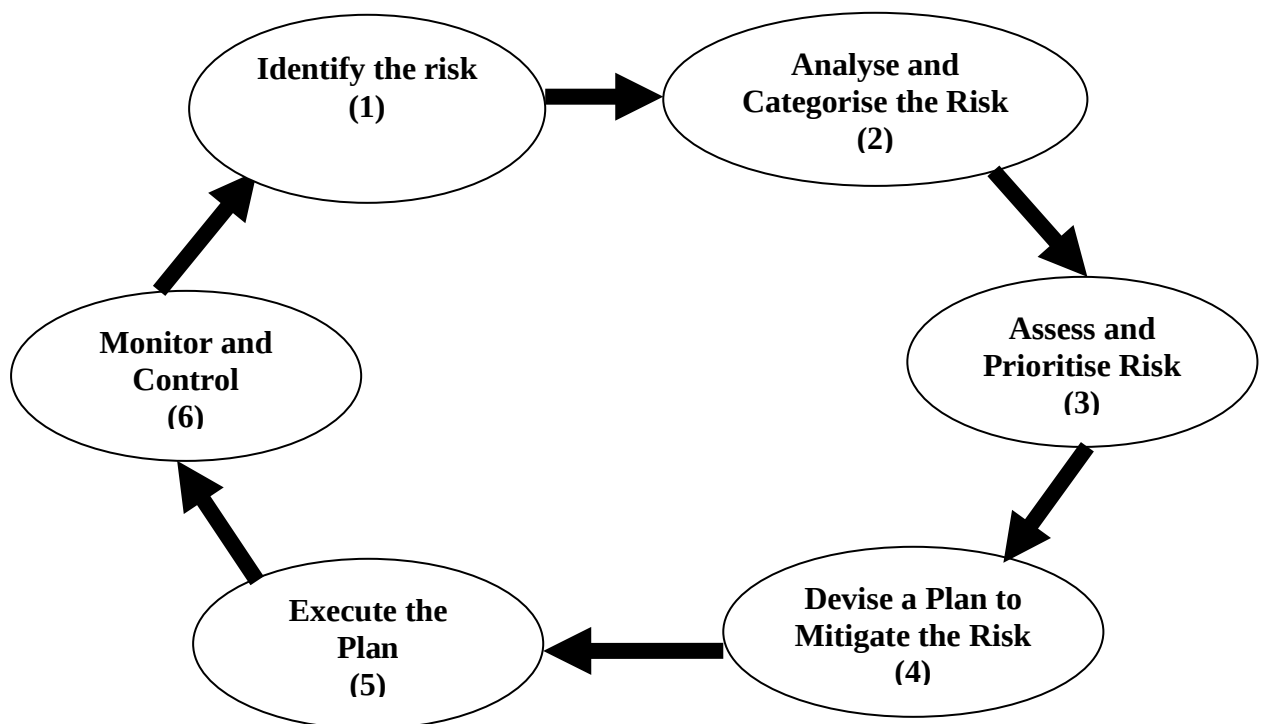
The lessons that can be adapted from the above discussion is related to the two discussions by Alavi and Weiss along with Gordon B. Davis, which talk about various control approaches and training respectively. One message that is

found is that EUC (including Spreadsheets) is useful to the organisation. Therefore, the key is not to discourage the development of spreadsheet models, but to have some control on the development of the same depending on the level and purpose of the use.

2.9 Towards a conceptual framework

This section would develop a conceptual framework, which will be used to layout the plan for the research. As highlighted in section 2.6 the key stages involved within any risk management process are as below:

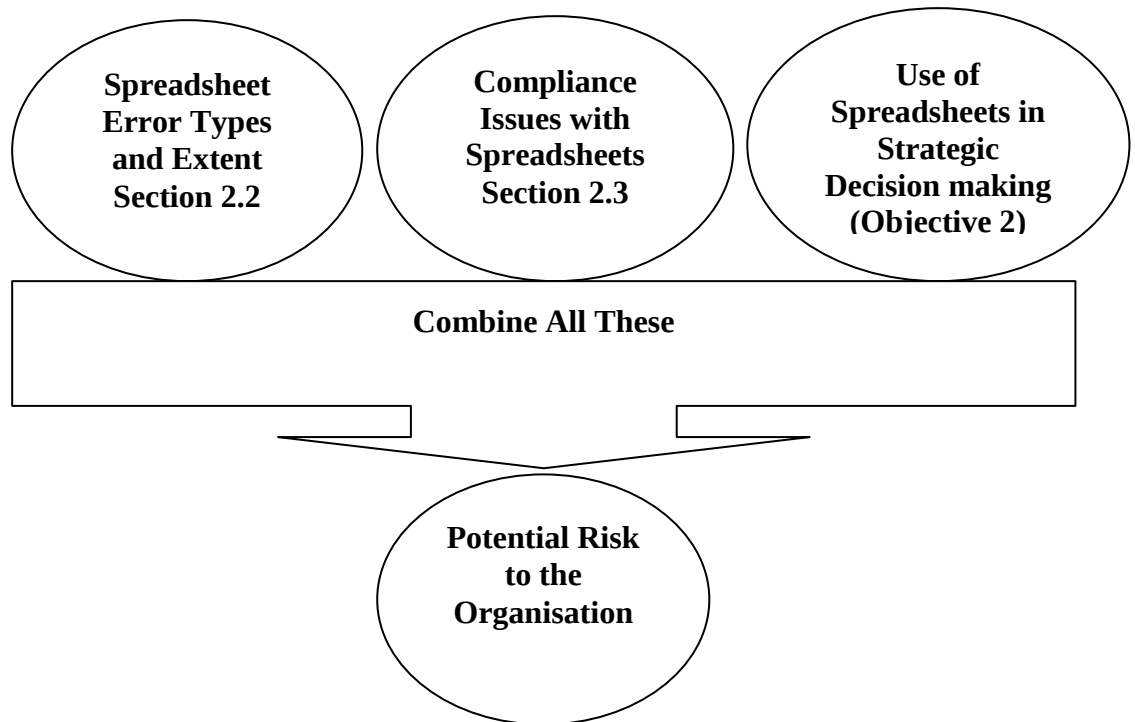
Figure 2.11: Conceptual Framework Development 1 (Author)



The sections 2.2, 2.3 and 2.4 highlight three key aspects about spreadsheets use. The first being the types and extent of errors, second being the compliance issue related to spreadsheets and the third issue which is then raised is about

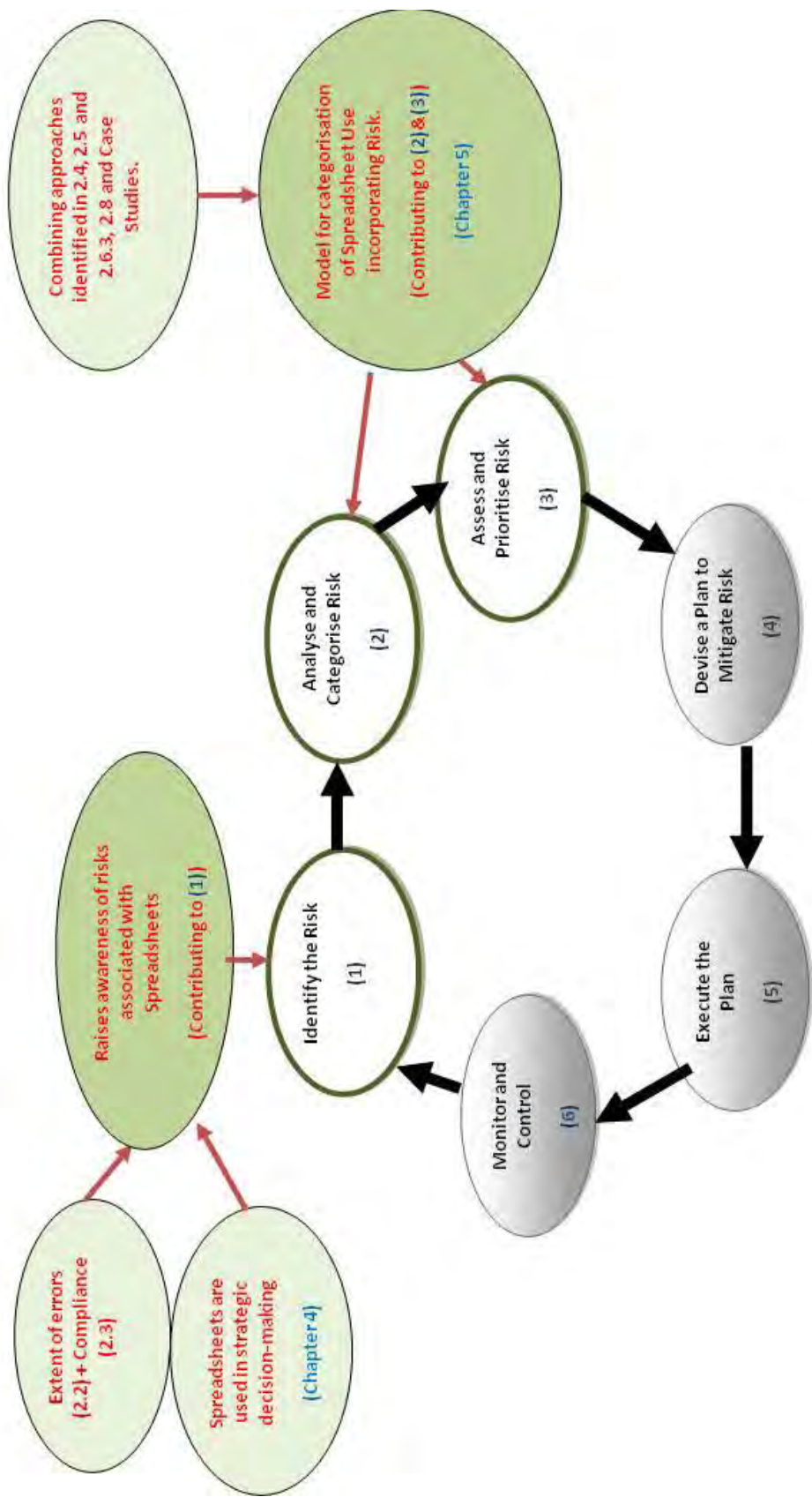
risks associated with spreadsheets. One of the potential missing links identified in these sections is the lack of awareness of Spreadsheets being risky for organisations.

Figure 2.12: Conceptual Framework Development 2 (Author)



It is evident that the use of spreadsheets within strategic decision-making is risky. The key reason that it has not yet been addressed as a part of the mainstream risk management is the lack of awareness of risks associated. The purpose of this research is therefore to raise the awareness of the risks associated with spreadsheet use within organisations and assist in mitigation of these risks. The grey bubbles in the conceptual framework (Refer Figure 2.13) are not covered in this thesis and form part of further research, which will be pursued as post doctoral work. Therefore, the final framework is as below:

FIGURE 2.13: THE CONCEPTUAL FRAMEWORK (Author)



2.10 Summary

It is very hard to define risk but the two key constituents of risk are *Hazard and Exposure*. One can only mitigate risk and not completely eliminate it. A typical risk management cycle involves various steps starting with identifying risk, followed by analysing, planning, tracking and controlling the risk. However, when it comes to a specific branch, such as spreadsheet risk, there is a key link missing, which is 'risk awareness'.

EUC is a rapidly growing, irreversible phenomenon. Spreadsheets are the most common EUC applications. The advantage of EUC is that they enhance the productivity of professionals but there are problems due to their lack of knowledge and experience in system development. These applications very rarely (almost never) have documentation and are subjected to very little validation or testing. Organizations are faced with a paradoxical situation as they cannot really rigidly control such applications but at the same time if these are allowed to develop openly with no control then there are many risks associated, that have been highlighted in this chapter. What organizations actually want is Kings (The Professional Domain Experts) with the knowledge of the Prophets (The IS Experts). More recently, due to the increased pressure of compliance, awareness of risks associated with spreadsheets has started catching the eye of management. There is anecdotal evidence that spreadsheets are used in strategic decision-making. If we assume for the time being that the spreadsheets are an integral part of the strategic decision-making framework then if we combine this with the extent of errors, it creates a

significant problem. This clearly indicates that there are gaps within academic research that need to be filled by firstly answering the question raised by Systems Modeling Ltd. (2003) “*Are any important decisions made in your company supported by spreadsheets?*” Then once this question has been answered and it has been identified that there is a problem, then one would need to work on a solution for it, which would involve the development of a framework for managing risks associated with spreadsheets.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

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Chapter 3: Research Design and Methodology

3.1 Introduction

Management and business students have been subjected to much controversy over the years about the most appropriate approaches to the study of management as an academic discipline and these dilemmas include issues concerning management research. To some extent this has been due not only to the emergence of different schools of management thought but also to the development of different approaches to research methodology, especially in the social sciences. There is no one best approach but rather that the approach most effective for the resolution of a given problem depends on a large number of variables, not least the nature of the problem itself. Research methodology is always a compromise between options, and choices are frequently determined by the availability of resources.

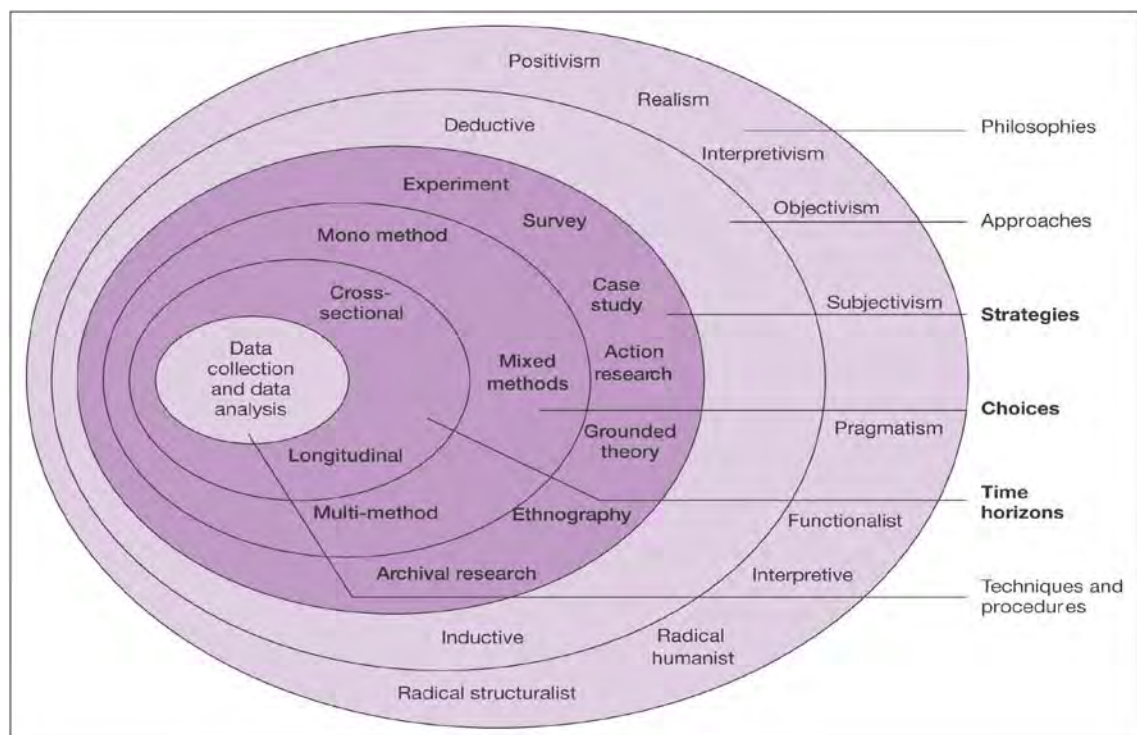
This argument is further supported by *Bechhofer (1974)* as quoted in Gill & Johnson (1997, p2) “Research...*is not a clear-cut sequence of procedures following a neat pattern but a messy interaction between the conceptual and empirical world, deduction and induction occurring at the same time*”. Although a good research study may not be a clear cut sequence of procedures, it should be structured and include processes like identifying the research topic, defining research problems, determining the way of conducting the research, collection of research data, interpretation and analysis of the collected data and finally the

writing up and dissemination. There are various methods of research design and each of them has advantages and disadvantages.

This chapter critically evaluates the various approaches that were available to the researcher and reasons for choice with limitations of the approach. It aims to provide insight into how the management and organisational aspects of the research have been undertaken. The research approach and techniques applied in collecting the necessary data together with their limitations will also be described in conjunction with how data analysis has been performed.

The author will discuss the research approach in detail for the two research questions. To discuss the research philosophy the author refers to the research onion model, suggested by Saunders *et al.* (2007) (See Figure 3.1).

Figure 3.1: Research Onion by Saunders *et al.* (2007, p102)



The methodology is discussed using Figure 3.1 following the research onion from the outer layers inwards. Therefore, after describing the two research questions, the author will discuss the Philosophy, Approach, Strategies, Method choices, Time horizons and finally the Techniques and procedures for this study.

The research starts with investigating the extent of use of spreadsheets within organisations, and the awareness and approach to the risks associated with them. This section is a quantitative evaluation through the use of questionnaires. The study then moves onto a more qualitative evaluation using case studies in order to develop a categorisation model for use of spreadsheets within organisations incorporating risk as one of the criteria. This is a descriptive-exploratory study.

3.2 Secondary Research

In describing the core elements of management research, Gill and Johnson (1997, p154) stress the centrality of a comprehensive review of the existing literature to the research process and describe the literature review phase of research as constituting:

...a critical review which demonstrates some awareness of the current state of knowledge on the subject, its limitations and how the proposed research aims to add to what is known.

A comprehensive review and critical appraisal of the relevant literature is thus crucial to formulating the underlying research questions to be examined by the

study and in the subsequent development of the specific research instruments to be utilized in the data gathering process. Following the approach used by Gill and Johnson (1997), at the outset of this research, the literature review involved the systematic searching of a number of major databases, such as EBSCO, Zetoc and Google Scholar using a list of key words and phrases. This allowed the researcher to identify as fully as possible all published material that broadly related to aspects of the research subject.

From this comprehensive search, relevant articles and texts were obtained, analyzed, annotated and classified. A majority of the articles/text used for the research was scholarly and peer reviewed. Once the article/text was found, the author read it and highlighted the key sections relevant to this study. The articles were then numbered on the basis of headings and subheadings within the literature review, so that the author only went through the articles relevant to the section that was being written. Subsequently, the references and bibliographies of key articles and texts identified from these databases were searched in order to follow up additional potentially relevant material. This literature review was an ongoing process right through the research and was continually updated as additional relevant material was published. The new publications, though not impacting on the development of the underlying research questions or the specific research instruments, enhanced the subsequent analysis of the primary data gathered during the field research.

The literature review commenced with highlighting the problem. This was done by highlighting research on spreadsheet errors and risks. The review of the extent of errors within spreadsheets helped to establish the importance of the research. As highlighted in section 2.3 of the literature review, due to cases like Enron, compliance has become a major issue within organisations. The main concern, besides other regulations highlighted by Cleary *et al.* (2005), is the Sarbanes Oxley Act 2002 which has increased focus on the operational risk and financial reporting within corporations. These concerns are lately being appreciated equally among both academics and practitioners. Spreadsheets, being one of the key elements of the information infrastructure within organizations, are starting to come under scrutiny in many organisations. Thus the researcher reviewed compliance issues and how they tend to affect the spreadsheets within organizations.

The author then moved onto various streams, such as general risk management, EUC, and IT risk management. The purpose of reviewing this was to see if any of these approaches can possibly be adapted for spreadsheet use. This part of the review helped the researcher to understand various types of risks that an organization is exposed to and general approach towards risk. This was done for the purpose of understanding how risk is perceived within organizations.

In order to set the scene for the second research question and more specifically objective three of the research (which was about investigating measures to secure spreadsheet use as a decision support tool and more specifically about

developing a categorisation model for spreadsheet use incorporating risk), it was necessary to highlight the research into categorization of spreadsheets. This clearly helped to identify how this research would add to the existing knowledge within the spreadsheet risk management literature.

Reviewing the literature highlighted gaps in existing knowledge and the identification of the research questions for the current study.

3.3 Research Mode:

In recent years debate about the nature of management research has focused on how to meet the double hurdle of being both theoretically and methodologically rigorous, while at the same time embracing the world of practice and being of practical relevance (Hodgkinson *et al.*, 2001). The debate is centred around Gibbons *et al.*'s (1994) work on the production of knowledge, and in particular the concepts of Mode 1 and Mode 2.

Mode 1: knowledge creation emphasises research in which questions are set and solved by academic interests, emphasising a fundamental rather than applied nature, where there is little if any focus on utilisation of the research by practitioners.

Mode 2: emphasises a context of research governed by the world of practice, highlighting the importance of collaboration of both with and between practitioners and the need for practical consequences. Starkey and Madan

(2001) further argue that research within the Mode 2 approach offers a way of bringing the supply side of knowledge represented by the universities together with the demand side represented by business and overcoming the double hurdle.

The current research is about investigating the role of spreadsheets within organisations and investigating means by which the risks associated with their use can be mitigated. This can be accomplished only by collaboration with the practitioners. The research then develops a theoretical model, which then can be implemented within organisations. In simple terms this is a case of theory informs practice informs theory continuum. Therefore it does not really fall into either of the mode categories entirely.

It is believed that all business and management research projects can be placed on a continuum according to their purpose and context (Saunders *et al.*, 2007). At one extreme of the continuum is research that is undertaken purely to understand the processes of business and management and their outcomes. Such research is undertaken largely in universities and largely as a result of an academic agenda. Its key consumer is the academic community, with little attention given to its practical applications. This is often termed *basic, fundamental or pure research*. On the other end of the continuum the research is of direct and immediate relevance to the managers, addresses the issues that they see as important, and is presented in ways they understand and can act on. This is termed *Applied Research* (Saunders *et al.*, 2007).

Table 3.1: Basic and Applied Research (Adapted from Smith *et al.*, 2002 and Hedrick *et al.*, 1993, cited by Saunders *et al.*, 2007, Pg. 8)

Basic Research	Applied Research
<i>Purpose:</i> - o Expand knowledge of process of business and management. - o Results in universal principles relating to the process and its relationship to outcomes - o Findings of significance and value to society in general.	<i>Purpose:</i> - o Improve understanding of particular business or management problem. - o Results in solution to a problem - o New knowledge limited to the problem - o Findings of practical relevance and value to manager(s) and organisation(s).
<i>Context:</i> - o Undertaken by people based in universities - o Choice of topic and objectives determined by the researcher - o Flexible timescales	<i>Context:</i> - o Undertaken by people based in variety of settings including organisations and universities - o Objectives negotiated with originator - o Tight timescales

The current research does not belong to one extreme or the other. It is inclined towards the Applied Research end of the continuum. On one hand it highlights the importance of spreadsheets within organisations and their involvement in strategic decision-making (Basic Research). On the other hand the second research question is about finding means to improve the decision-making process within organisations. The study is using a practical working environment to enhance the validity of the findings. The research is applied research as far as the problem being addressed is concerned, but the only aspect that is different is that the topic and the objectives are determined by the researcher. The need for the study originated from the forum of EUSpRIG which is a research group comprising of practitioners and academics. The proportion of practitioners in EUSpRIG outweighs academics. They run a well-established annual conference which provides a forum for researchers, practitioners, trainers, vendors, consultants and auditors (www.eusprig.org). The author is an

active member of this group and an academic with a non-financial and non-technical background. Therefore this research approached the misuse of spreadsheets and the risks associated as a business problem.

3.4 The Approach Towards The Two Research Questions

This study contributes to the current knowledge of spreadsheet risks within organisations. There is anecdotal evidence that spreadsheets are used for strategic decision-making and are critical for organisations. This research started by establishing through a review of the literature the relative importance of spreadsheets within organisations. The first research question was about establishing that spreadsheets are used for strategic decision-making within organisations and are an integral part of an organisation's decision-making framework. Once this is combined with the level of errors within spreadsheets (as highlighted in the Literature review; Section 2.2) the exposure of organisations to significant risk is raised.

The primary research addressed the two research questions set out in the introduction chapter independently and different approaches were followed for the two questions. The first question was related to establishing through research that spreadsheets are used for strategic decision-making within organisations and have a critical role within these organisations. This was done based on a survey technique as the author intended to establish that the findings of the first research question could be generalised across different organisations (i.e. high external validity).

The second question was related to finding measures to secure the use of spreadsheets as decision support tools. In order to achieve this, a model was developed to categorise spreadsheet use within organisations incorporating risk. This required a more in-depth analysis of the sample organisations in order to establish both depth and width of spreadsheet use within organisations. This was achieved by following a case study approach.

3.5 Research Philosophy

As highlighted by Saunders *et al.* (2007) the research philosophy adopted contains important assumptions about the way in which one views the world. These assumptions underpin the research strategy and further the methods that one chooses and adopts. The philosophy is discussed in the light of three ways of thinking; Epistemology (Positivism, Realism and Interpretivism), Ontology (Objectivism, Subjectivism and Pragmatism) and Axiology (Functionalist, Interpretive, Radical humanist and Radical structuralist). Denscombe (2008) highlights that theoretical debates have been deep, complicated and, sometimes, abrasive between researchers who hold different beliefs about the nature of social reality ('ontology') and competing visions about the ways that humans create their knowledge about the social world in which they live ('epistemology').

Epistemology concerns what constitutes acceptable knowledge in a field of study, looks at where this knowledge has come from and how we know what we

know. It is the study of the nature of knowledge and justification. (Dawson, 2002) This research follows an epistemological approach of thinking.

Within epistemological thinking the choices available to the author were:

1. Positivism: where emphasis is on highly structured methodology and external validity is the key. Survey technique is commonly used within this philosophy, which is driven by gathering facts that provide basis subsequent hypothesis testing. The emphasis is on quantifiable observations which lead onto statistical analysis.
2. Interpretivism: where the emphasis is on understanding differences between humans in their role as social actors. This philosophy argues that the business world is too complex to have law-like generalisations. Therefore, generalisability is not of crucial importance.

Saunders *et al.* (2007)

Objective two of the research was about establishing the extent of spreadsheet use in strategic decision-making, which required higher external validity, i.e. high generalisability. This was done based on survey technique. This put is more towards positivistic philosophy. On the other hand objective 3 was about developing a model, which requires more in-depth analysis of rich data and lends itself more towards an interpretivist philosophy. The author, therefore, could not stick with just one of the two philosophies throughout the thesis. This echoes with Saunders *et al.* (2007, p110) that, *“business and management research is often a mixture between positivist and interpretivist”*.

The philosophy followed by the researcher is Pragmatism, which is about applying a practical approach, integrating different perspectives to help collect and interpret data. Pragmatism is a philosophical system that rejects the forced choice between positivism (including post-positivism) and interpretivism with regard to methods, logic and epistemology. It is a *“reactive debunking philosophy that argues against dominant systematic philosophies, making mocking critiques of metaphysical assertions such as “the grand Either-Or”* (Tashakkori and Teddlie, 1998, p23). Friedrichs and Kratochwil (2009), highlight that pragmatism has grown from tacit commonsense to an explicit item on the agenda of research. The philosophy of Pragmatism argues that *“the most important determinant of the research philosophy is the research question, arguing that it is possible to work within both positivist and interpretivist positions.”* (Saunders et al., 2007, p607) It is highlighted that one approach might be better than the other for answering a particular research question. According to Tashakkori and Teddlie, (1998, p30):

Pragmatism is appealing (a) because it gives us a paradigm that philosophically embraces the use of mixed method and mixed model designs, (b) because it eschews the use of metaphysical concepts (Truth, Reality) that have caused much endless (and often useless) discussion and debate, and (c) because it presents a very practical and applied research philosophy: study what interests and is of value to you, study it in the different ways that you deem appropriate, and use the results in ways that can bring about positive consequences within your value system.

Morgan (2007) in his paper titled, ‘Paradigms Lost and Pragmatism Regained’ in *Journal of Mixed Methods Research*, also advocates a pragmatic approach

as a new guiding paradigm in social science research methods, both as a basis for supporting work that combines qualitative and quantitative methods, thereby diverting our attention towards “*methodological rather than metaphysical concerns*” (Denscombe, 2008, p5).

Doyle *et al.* (2009), Denscombe (2008) and Morgan (2007) also acknowledge the third paradigm of research within social science, which is referred to as the mixed-method approach. The emergence of this approach has much to offer in health and social science research (Doyle *et al.*, 2009). It is further highlighted by Doyle *et al.*, (2009, p175) that:

Its emergence was in response to the limitations of the sole use of quantitative or qualitative methods and is now considered by many a legitimate alternative to these two traditions. Purists’ view of the dichotomy between positivist and non-positivist philosophies is prevalent; however, mixed methods afford researchers an opportunity to overcome this ‘false dichotomy’. The philosophical underpinning of pragmatism allows and guides mixed methods researchers to use a variety of approaches to answer research questions that cannot be addressed using a singular method.

The earlier part of the study (Objective Two) is primarily quantitative and the latter part (Objective Three) is qualitative in nature. This research is therefore following different philosophies/approaches for the two objectives. This further allowed triangulation between the different methods adopted within the research. This is further clarified and discussed in the following sections.

3.5.1 Objective Two

The research uses a structured survey approach to investigate the extent of the use of spreadsheets within organisations, the level of importance they have for individuals and organisation as a whole. The researcher chose a wide sample

for this research and this was established through a series of studies done within UWIC (in UK) and a survey conducted internationally in collaboration with Tuck Business School (Dartmouth University) in USA. The author, besides other questions, developed a complete section related to risk management in the survey (see Appendix 1). Statistical analysis of the responses to the survey was done using SPSS and observations were then made relating to Objective Two of the research. A positivist approach was mainly used for investigating objective two. The objective was to establish that **‘Spreadsheets are used for strategic decision-making within organisations’**. This statement is established on anecdotal evidence and discussions within the EUSpRIG. Further details about EUSpRIG have are discussed in section 3.7. This is consistent with the notion of observable social reality similar to that employed by the physical and natural scientists (Saunders *et al.*, 2007).

The approach for objective two of the research adheres to the premise highlighted by Denscombe (2008, p270 - p283) that:

- *“The patterns and regularities in the social world exist quite independently of whether they are recognised by people (**ontology; nature of the social world**)”*. This section was clearly trying to prove academically something which is highlighted through anecdotal evidence i.e. Spreadsheets are used in strategic decision-making. Most of the organisations tend to overlook this fact, but this research intended to prove that this is a general pattern within organisations for use of spreadsheets.

- *“There is a reliance on empirical observation (**research methods**)”. It is taken as a fundamental that theories and explanations can have no credibility unless they are based upon observation or can be corroborated through observation.*
- *“Social research needs to use appropriate tools and techniques to discover and examine the patterns and regularities in the social world, tools and techniques that do not interfere with or influence the observed reality (**epistemology**).”* The aim of the objective two was simply to measure what exists without any involvement of the researcher, without impinging on the parameters being measured.
- *“The neutrality of research tool is echoed from this perspective by the value of neutral stance of the social researcher (**epistemology**).”* The researcher in no way influenced the collection of data. The questionnaire was available online for the respondents to fill. In agreement with Denscombe (1998), the researcher retained a detached, impartial position in relation to what was being studied and did not let personal feelings or social values influence the questions pursued, the results reported or the analysis of the findings.

3.5.2 Objective Three

The approach towards this objective starts off by investigating the use and development of spreadsheets within organisations. The author accepted that business situations are complex and unique. They are a function of a particular set of circumstances and individuals. Interpretivists argue that generalisability is

not of crucial importance. However, perhaps the strongest argument the interpretivist could mount is the necessity to uncover the details of the situation to understand the reality. It is necessary to explore the subjective meanings motivating people's actions in order to be able to understand these. The role of the interpretivist is to seek to understand the subjective reality of those being studied to understand their motives, actions and intentions in a way that is meaningful for these research participants. The investigation for this objective started with interviewing individuals within one department in an organisation on the extent and type of use of spreadsheets and their purpose. The investigation was to find out why, for what, and how spreadsheets are used by these individuals. This puts this part of the investigation into the interpretivist approach. The intention was to investigate why individuals design spreadsheets and for what purpose. How do they incorporate these spreadsheets in their daily use and decision-making? As highlighted by Denscombe (2002), it is not possible to gain objective knowledge about a social phenomena. This is supported by Charmaz (2006, p141) when she says, "*we interpret our participants' meanings and actions and they interpret ours*". The interview questions were open-ended and the format was semi-structured, which gave an opportunity to the interviewees to express their ideas and opinions. It was not a basic question and answer session; rather it was an open discussion held at the employee's desk and involving discussion of actual spreadsheets developed and used by the employee. The latter part of the research is a lot more structured and interprets the findings from the interviews in a more structured way. Thus this part can be interpreted in the light of

combined pragmatist philosophy discussed earlier i.e. applied research. The intention of the researcher was to develop a model for categorisation of spreadsheet use within organisations incorporating risk (as one of its dimensions).

3.6 Research Approach (Deductive/ Inductive)

Following a pragmatist philosophy gives the flexibility to the researcher to adopt and follow different approaches depending on the objective and choose the most appropriate methods. Any research project involves theory. The extent to which you are clear about the theory at the beginning of your research raises an important question concerning the design of the research project.

It determines whether the research should use a *deductive approach*, in which one develops a theory and hypothesis (or hypotheses) and design a research strategy to test the hypothesis, or the *inductive approach*, in which data is collected and theory developed as a result of data analysis.

The deductive approach owes more to positivism and the inductive approach to interpretivism, although it is believed that such labelling is potentially misleading and of no practical value (Saunders *et al.*, 2007).

3.6.1 Objective Two

This objective tends to follow a more deductive approach. There is anecdotal evidence that spreadsheets are used in strategic decision-making. The

research in this phase was approached to fulfil Objective Two (see also section 3.3).

Robson (2002) lists five sequential stages through which deductive research will progress:

1. Deducing a hypothesis (a testable proposition about the relationship between two or more events or concepts) from the theory; (*The researcher based the hypothesis on anecdotal evidence; 'Spreadsheets are used in strategic decision-making'*). As discussed earlier, the anecdotes came from conversations with practitioners as well as the EUSpRIG discussions.
2. By expressing the hypothesis in operational terms (i.e. ones indicating exactly how the variables are to be measured), and proposing a relationship between two specific variables;
3. Testing this operational hypothesis (this will involve an experiment or some other form of empirical enquiry); (*The means used for measuring the hypothesis was through a survey and three post-graduate studies (Two MBA Dissertations and one MSc (Information Systems) Dissertation done under the supervision of the author within the UWIC Cardiff School of Management)*). These studies will be discussed in detail as a part of the data analysis for this objective and shall partially contribute to the objective three.

4. Examining the specific outcome of the enquiry (it will either end by confirm a theory or by indicating the need for its modification);
5. If necessary, modifying the theory in the light of the findings.

Gill and Johnson (2002) highlight that within a deductive approach, one's research would use a *highly* structured methodology to facilitate replication, which is an important issue to ensure reliability (to be discussed in section 3.9).

3.6.2 Objective Three

In this objective the author followed a different approach. He was trying to develop a framework for categorising spreadsheets. This, according to the researcher required a mix of inductive and deductive approach. The initial part was more of an in-depth investigation within organisations. As a result of this initial models for categorising spreadsheets were proposed. These models were then discussed and revised and finally the model was refined through further investigation within another case study organisation.

Using an inductive approach, theory follows data. Research using an inductive approach would be particularly concerned with the context in which such events were taking place. Therefore the study of a small sample of subjects might be more appropriate than a large number as with a deductive approach. Researchers in this tradition are more likely to work with qualitative data and use a variety of methods to collect data in order to establish different views of

phenomena (Easterby-Smith *et al.*, 2002). Thereby this objective involved an in-depth analysis of two case study organisations.

3.7 Research Strategies

This is a general plan of how one will go about answering the research question(s). One must have valid reasons for all research strategy decisions. The justification should always be based on the main research question which should be the driver for the whole research process.

3.7.1 Objective Two

The research for this objective concentrated more on the collection and analysis of quantitative data. The approach was deductive approach and a technique often associated with this approach is the survey strategy which is a popular and common strategy in business and management research. It allows the collection of a large amount of data from a sizeable population in a highly-economical way. The quantitative survey was designed and made available online. The respondents to the survey were mainly the alumni of the Tuck Business School. This was opportunistic as the researcher met with representatives from Tuck Business School at one of the EUSpRIG conferences and the idea was discussed. Finally, the two units agreed to work on this survey together. The author designed one complete section in the questionnaire along with other questions in the questionnaires. Tuck Business School hosted the survey online and forwarded information on the online survey to their alumni. This was considered to be the most economical means to collect

data for this objective. Survey approach has been criticised at times as being authoritative (Saunders *et al.*, 2007). Using this strategy gives the researcher more control over the research process. However the data collected by survey strategy might not be as wide-ranging as those collected by other research strategies. Surveys are considered to be intermediate between experimental and ethnographic research.

Burns (2000) identifies two types of surveys:

- The *descriptive* survey aims to estimate as precisely as possible the nature of existing conditions, or the attributes of the population.
- The *exploratory* survey seeks to establish cause and effect relationships but without experimental manipulation.

The survey conducted by the researcher was a combination of the two approaches, i.e. it was descriptive-exploratory. The purpose being to identify the extent of use of spreadsheets within organisation and assess the levels of awareness of risks and problems associated with them.

Zikmund (1994) addresses the ethical issues related to survey research, such as the respondent's right to privacy; the use of deception, the respondent's right to be informed about the purpose of the research; the need for confidentiality, the need for honesty in collecting data, and the need for objectivity in reporting data. The information collected through the survey was kept anonymous. The questionnaire was non-biased and did not ask the respondent to state their

name, etc. The respondents were provided with full details of the purpose and scope of the questionnaire.

3.7.2 Objective Three

This is inspired by grounded theory. The initial investigation, which was primarily fact finding and in depth investigation into the use of spreadsheets within the organisation, had its roots in a modified grounded theory approach. Grounded theory (Glaser and Strauss, 1967) is often thought of as the best example of the inductive approach, although this conclusion would be too simplistic. It is better to think of it as “*theory building*” through a combination of induction and deduction (Saunders *et al.*, 2007, p142). The researcher through the interviews gathered information about how spreadsheets were being developed and used within the organisation. Once the information was gathered, it was analysed critically and various models of categorisation were developed and critically evaluated. In grounded theory, data collection starts without the formation of an initial theoretical framework. Theory is developed from data gathered by series of observations. These data lead to generation of predictions that are then tested in further observations which may confirm, or otherwise, the predictions.

The researcher chose two case studies. The first case study was mainly to identify the use of, and develop a model for categorisation of, spreadsheets. The subsequent case study was to further refine the model and validate it. Robson (2002, p178) defines a case study as, “*a strategy for doing research*

which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence". The case study strategy also has considerable ability to generate answers to the 'why?' and 'how?' questions, although 'what?' and 'how?' questions tend to be more the concern of the survey strategy (Yin, 2009). The case studies were done with the purpose of answering the 'why' and 'how' about the use of spreadsheets. Yin (2009) and Burns (2000) further suggest that 'multiple-case' designs are likely to be stronger than 'single-case' designs. This is the reason that the researcher adopted a 'multiple-case' design. The two case studies were based within different departments of UWIC. Case study 1 was based on Accommodation Section within Facilities Department of UWIC. Case study 2 was based on the Finance Department within UWIC. Out of the four case study designs proposed by Yin (2009) the author followed 'multiple case designs' (Type 3). As compared to the other research methods case study approach needs an inquiring mind during data collection, and not just before or after (Yin, 2009). Therefore extra care had to be taken in conducting the interviews as the researcher had to be adaptive and flexible. Yin (2009) highlights six potential sources of evidence for the development of case studies:

- Documentation
- Archival records
- Interviews
- Direct Observations
- Participant-observation
- Physical artefacts.

For this study the two sources used were documentation and interviews. The author reviewed internal records, including spreadsheets stored on individual machines, of the case study departments along with conducting qualitative interviews.

3.8 Data Collection Methods and Analysis

The research followed a mixed-method approach for data collection. It used a combination of qualitative and quantitative techniques. There are two major advantages to choosing to use multiple methods in the same research project. First, different methods can be used for different purposes in the study. For example in this study we have used questionnaires for the initial stage and then semi-structured interviews for the latter stage. The second advantage of using mixed-methods is that it enables triangulation to take place. (Saunders *et al.*, 2007) The researcher used triangulation as far as analysing primary data is concerned. In order to come up with the model for categorisation the author had to triangulate the findings of the interviews with the literature on risk management and spreadsheet use. Besides this some questions in the interview were used to verify the findings of the survey. Saunders *et al.* (2007, p139) highlights one such example: *“qualitative data collected using semi-structured interviews may be a valuable way of triangulating quantitative data collected by other means such as questionnaire”*. This was similar to the current study.

The author developed 40 questions related to the purpose of this investigation. These questions were developed after reflection from the literature review. The first question was to identify what package was the most common one within the software tools used within the organisation. The questions were of two types, the first ones related to the individual context and the second were about the organisational context. Q2 to Q6 were related to importance of spreadsheets to individuals, their experience and training, and individual time spent on spreadsheets. This was done to assess how individuals work on spreadsheets. There were further questions asked about the creation of spreadsheets and approach towards creation (Q13, Q14 and Q19). The author observed in the literature review (see section 2.2.2) that the individuals who create spreadsheets are not trained in system development methodologies, so Q19 was included to find if there was any development methodologies used in the creation of spreadsheets. The extent of errors was discussed in chapter two (see section 2.2.2). In order to assess how these errors could penetrate the organisation there were questions related to spreadsheet sharing (Q20, Q21 and Q29), testing (Q22) and protection (Q33). To investigate the organisational context the author asked about organisational training (Q43) and standards and policies for spreadsheet use (Q51 and Q52). A complete section on spreadsheet risk management (Q53 to Q59) was added to the questionnaire. These questions were developed after considering chapter two, sections 2.3 and 2.4 where issues related to spreadsheet were discussed in the light of compliance and risk. Finally there were eight questions (Q60 to Q67) which

were asked to get the demographic and functional profile of the respondents and the organisations they worked for.

The introduction to the questionnaire discussed the purpose of the study. The respondents were not asked for any personal details such as name, so that they could highlight their true perception anonymously and be more open. The final questionnaire (Appendix 1) consisted of 67 questions, which also included questions for Tuck Business School. The questions that were not related to this investigation have been highlighted in red in Appendix 3. The final questionnaire was organised by Tuck Business School around the seven-stage life cycle model for a typical spreadsheet. These stages are: designing, testing, documenting, using, modifying, sharing, and archiving. The questionnaire took about 15-20 minutes to complete. As a part of the Pilot Testing of the Questionnaire it was circulated to the Spreadsheet Research Group within UWIC. No changes were recommended as a result of this.

The questionnaire was available online and the link was sent in an email for the respondents to follow. The population consisted of the Tuck Business School MBA Alumni. Tuck Business School, Dartmouth College is an Ivy League University and the graduates are placed in a wide range of organisations and at various levels of management, which can be seen in the profiles of the respondents in chapter 4. The data received through the questionnaire was coded (see Appendix 2) and then analysed using SPSS. The summary of

responses highlighting the questions that were used for this study has been highlighted in Appendix 3. Altogether 689 responses were received.

The investigation for objective three of the study started with a pilot case study being carried out in the Accommodation Department at UWIC followed by another case study within the Finance Department at UWIC. These case studies were conducted in order to analyse the subjective reality of the use and development of spreadsheets within the department in order to understand how they use spreadsheets and their perceptions of their importance and the risks associated with them.

The data collection method adopted for this phase of the research was interviews. The author had a choice of three types of interviews: structured; semi-structured; unstructured Interviews. It was decided that semi-structured interviews would be the best option, in order to extract maximum information without any bias or influence on the interviewee and to make sure that the key areas are covered in order to address the objective of the research. The interviews were interactive and during the interviews the respondents were asked to open spreadsheets that were stored on their computer and to go through them, highlighting what they were used for. The use of the files assisted in identifying the dimensions for the models and the categories within the model. This is reflected in the themes identified in Appendix 4 and 5 for both the case studies.

The researcher conducted seven face-to-face interviews for case study 1, which covered the whole department. Given that the researcher was unfamiliar with interviewing, themes to be discussed were developed to ensure consistency. The initial questions were to break the ice and to make the interviewee feel comfortable. They focused on relatively-broad conceptual issues, progressing to specific practical issues during the course of the interview, with the aim of producing rich and detailed accounts of the participants' perceptions of the spreadsheet use and development. The researcher used a PowerPoint presentation to give the respondents some background to the research before starting the interview. In situations where the researcher did not have an access to computer, the background to research was explained verbally. As the interviewer grew in confidence, the interviews became more like conversations about the research area.

The case study 1 interviews were conducted in July – August 2006. Taping the interviews permitted reflection later on the researcher's ability and role as an interviewer. The interviews were transcribed and these transcripts played a valuable role in reflecting on the questions asked and whether the right people were involved. The questions and the interview process were accordingly amended for the case study 2 interviews.

The data gathered was analysed to identify the spectrum of use of spreadsheets within the department. The author identified emerging themes. Once the themes were identified, commonality and differences between the

themes was analysed. Once these themes were grouped the author was able to identify the categories for the proposed models. After the analysis of these interviews, the author proposed three possible basic models for categorisation of spreadsheet use. The author initially presented the models at the Institute for Operations Research and Management Sciences (INFORMS) Conference, 2006 at Pittsburgh, USA followed by EUSPRIG Conference in Greenwich, UK in 2007. The author received an award for his paper at EUSpRIG 2007 for the 'Best Academic Paper'. The contribution and the approach towards risk mitigation of spreadsheet use, was appreciated by the practitioners and academics. The paper was then published in the conference proceedings. The feedback from these conferences was also incorporated into the study.

The author then conducted the second case study within the Finance Department of UWIC. This involved seven face-to-face interviews, covering the entire department. These interviews were conducted during the period August – September 2007. The interviews in this case also were semi-structured. The purpose of this case study was to refine and finalise the model for categorisation of spreadsheet use within organisations incorporating risk. This was accomplished by integrating the literature review, with the findings of the case study along with the documents from case study and the discussions at the conference presentations. The final model was then presented at the INFORMS Conference, 2008 at Seattle, USA where the author chaired a session on Spreadsheet Use and EUC within large organisations.

During the study, there was an online discussion on the EUSpRIG forum on the theme of 'why spreadsheets'. This discussion took place in January - February 2010. Many practitioners and academics contributed to the discussion, including Ray Panko who is a well-respected academic in the field of spreadsheet errors and risk. This discussion was very close to the theme of the current study so the author decided to do qualitative analysis of it (refer Appendix 6). The author identified 58 themes. The themes were analysed for commonality and differences. Eventually the themes were grouped under three final headings:

- Importance of Spreadsheets;
- Problems with Spreadsheets;
- Solutions to the problems associated with spreadsheet use.

3.9 Reliability and Validity

Validity, according to Blaxter *et al.* (1996), relates to whether the methods, approaches and techniques used by the researcher actually related to, or measure, what they are supposed to measure or describe.

The most obvious type of validity is content validity. The interviews conducted for the pilot were completely transcribed to assess if the right questions were being asked and to the right people. This helped in improving content validity.

The questionnaire designed with Tuck Business School was piloted, in order to assess the appropriateness of the questions asked and was refined accordingly before being administered to the wider set of respondents.

The questionnaire was administered to a wide variety of organisations, which enhanced the reliability and external validity of the data. Different types of organisations were covered within the survey (Government 0.4%; Manufacturing 18.5%; Service including banking, retail, consulting etc. 53.1%; Agriculture and natural resources 1%; Education 3%; Health and medicine 5.5%; Other non-profit 2.1%; Other 16.3%), so that the researcher could confidently generalise the findings. The model developed as a result of the pilot study was discussed with experts and practitioners, at the conferences stated above, to strengthen reliability of findings. The mixed-method approach further added to the validity and reliability of data. Yin (2009) highlights two ways to enhance validity in the case study approach:

- Use theory in single – case studies
- Use replication logic in multiple – case studies.

This research followed the second option to enhance external validity.

3.10 Limitations

The complete study was self funded by the researcher, so the researcher had to settle with the opportunities that were offered. This was the reason that the offer from Tuck Business School, Dartmouth College, USA was accepted straight away. This added an advantage in the research, as Tuck Business School is very highly-reputed international institute, so their MBA alumni are well placed around the world in big organisations, across different sectors and in different levels of management. This helped the research to have a global perspective. There were further restrictions on time.

Another limitation faced was related to access to the organisations. Through EUSpRIG the author was put in touch with representatives of Her Majesty's Customs and Excise (HMCE). The discussions to have access for the case study went to advanced stage. Later on, due to the merger of HMCE and Inland Revenue to form Her Majesty's Revenue and Customs (HMRC), access to the case study organisation was withdrawn. The author had to change the plan for the case studies. Access to two UWIC departments was then granted for the research to progress. This created another limitation that both case studies were from the public higher education sector. This limitation was addressed to an extent due to triangulation of the data with the literature to develop the models, so that any bias could be negated. The terminology used within the model was universally acceptable within the public and private sector. The practical approach towards risk management discussed in section 2.6.3 incorporated both private and public sector organisations.

The author struggled to find literature within the specific field of spreadsheet risk. This emphasises the value of the research, but was a limitation to the research as well. The wider literature had to be investigated and it was mainly related to EUC. Even within this field there was a limited literature. There were many authors who had written in the field in the 1980-90s. Then there was a gap and eventually there are some authors who have written more recently.

3.11 Summary

Objective 1 was related to critical evaluation of the literature and this was used to develop the conceptual framework (see Figure 2.13) for mitigating risks associated with spreadsheet use within the strategic decision-making process. Figure 3.2 below summarises the research method approach and strategy and Figure 3.3 highlights how different methods link together.

Figure 3.2 Research Methodology Overview.

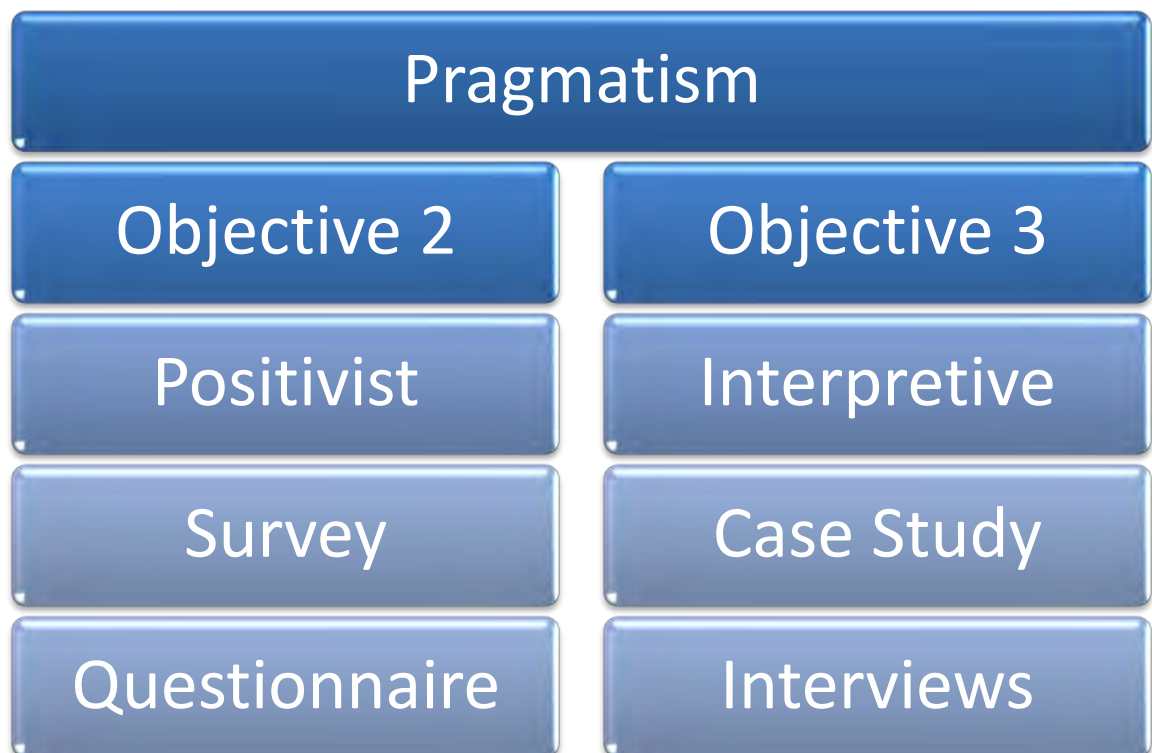
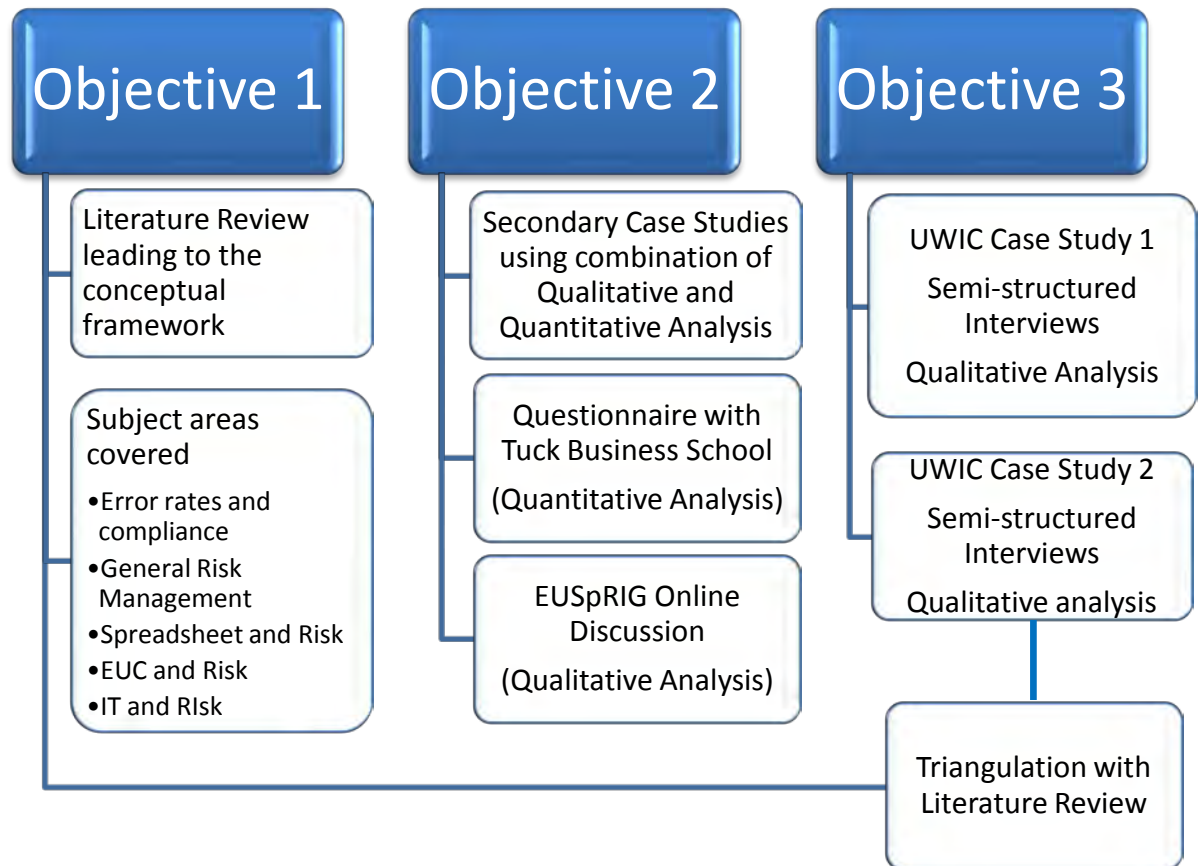


Figure 3.3 Research phases



CHAPTER FOUR

SPREADSHEET USE WITHIN ORGANISATIONS

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Chapter 4: Spreadsheet Use within Organisations

4.1 Introduction

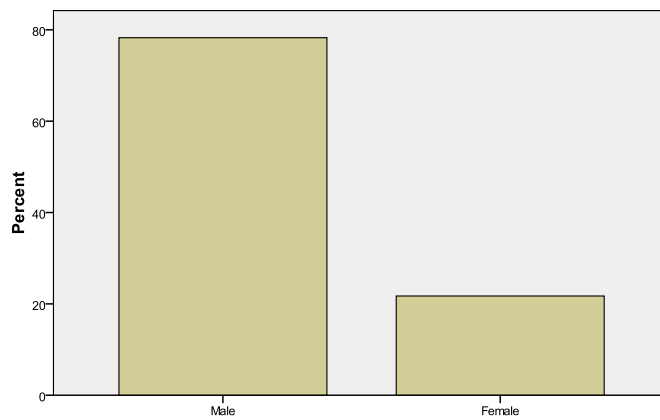
This chapter will highlight the key findings from the data collected related to Objective 2. The chapter will start with the analysis of the questionnaire responses which was done in collaboration with Tuck Business School at University of Dartmouth, USA (see Appendix 3). This is then followed by highlighting key findings from the studies within the spreadsheet research group. Finally the qualitative analysis of the online discussion on the expert forum of EUSpRIG (see Appendix 6) is presented. The chapter will then be summarised with the key findings.

4.2 Demographic profile of respondents

This section highlights some descriptive information of the sample that was tested.

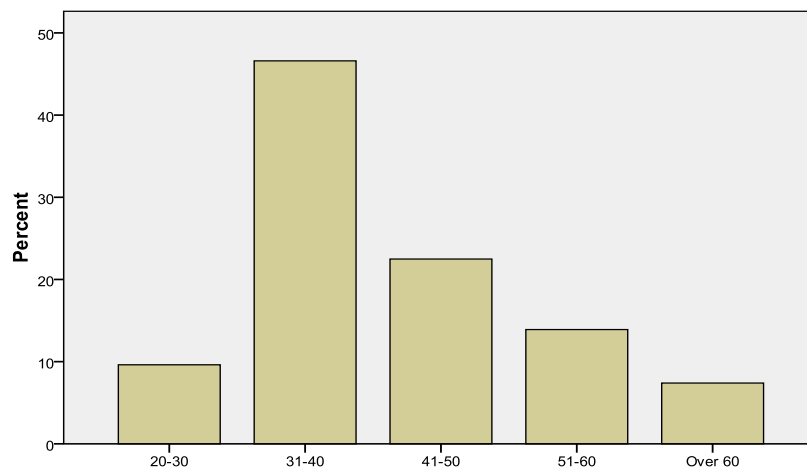
Gender

The majority of the respondents were male (526 out of 672, 76.3%) as shown in Figure 4.1.

Figure 4.1: Gender Distribution

Age distribution

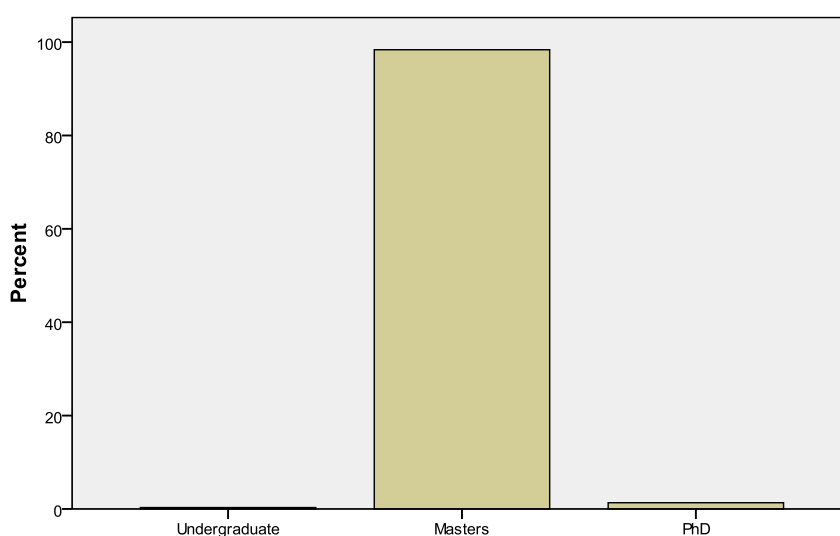
About two-thirds (467 out of 676, 67.8%) of the respondents were within the range of 31-50 years of age.

Figure 4.2: Age Distribution

Education

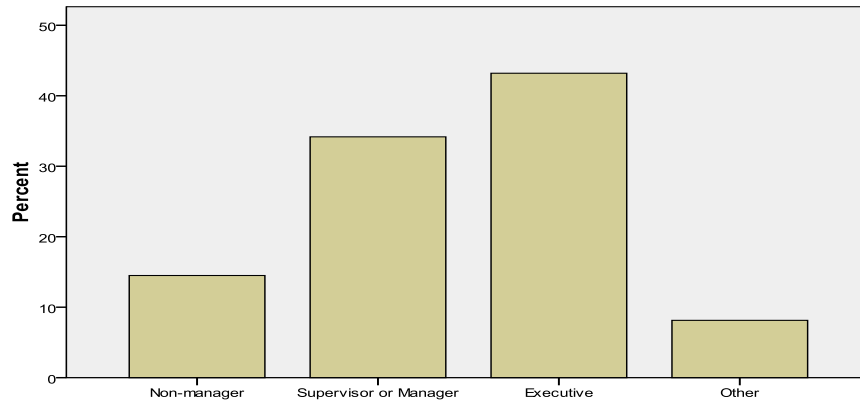
All of the respondents were alumni of Tuck Business School and the majority of the respondents were MBA alumni of the Tuck Business School, 96.2 percent (663 out of 674) of the respondents had a Masters qualification.

Figure 4.3: Education Qualifications



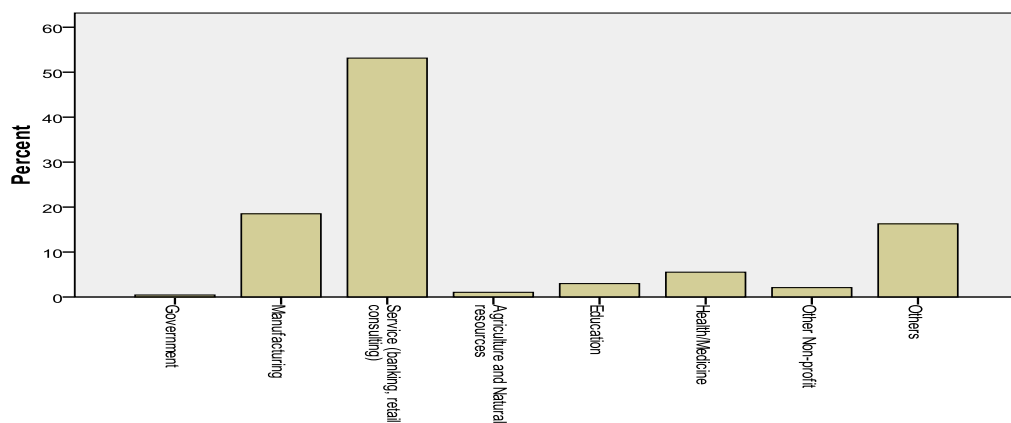
Position in Organisation

Most of the respondents (523 of 676, 75.9%) were management staff including supervisors, managers and executives. The 8% others included people such as Owner/Proprietor, Consultants, Financial Analyst and Teachers/Professors etc.

Figure 4.4: Position within the organisation

Organisation Sector

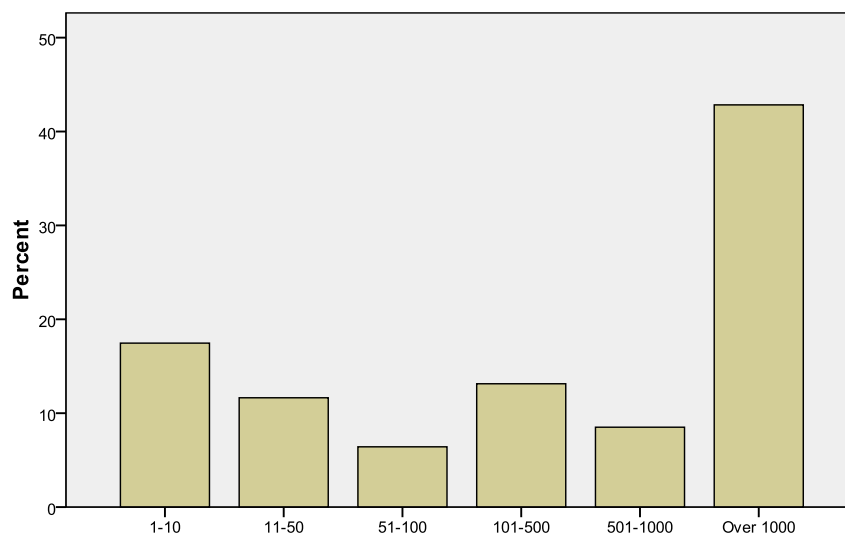
The sectors of the organisations surveyed represented a broad spectrum of public and private sector organisations including manufacturing, health, service, education etc. The most dominant category was the service sector with 51.7% (356 of 670) respondents coming from this category.

Figure 4.5: Sector of the organisation

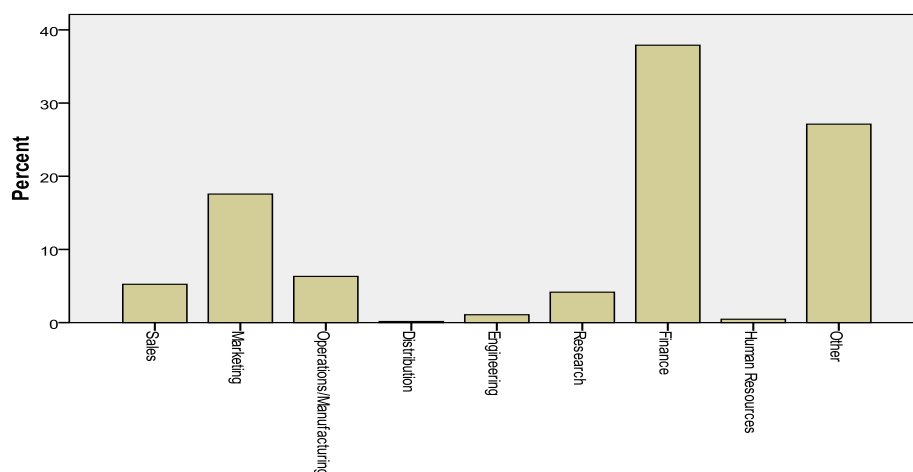
Number of Employees in your organisation

A range of organisations were covered, but the majority of them were large scale organisations. 50% of the respondents (344) were from organisations which employed over 500 employees. Smaller firms were presented, with 28.3% firms (195) employing less than 50 employees.

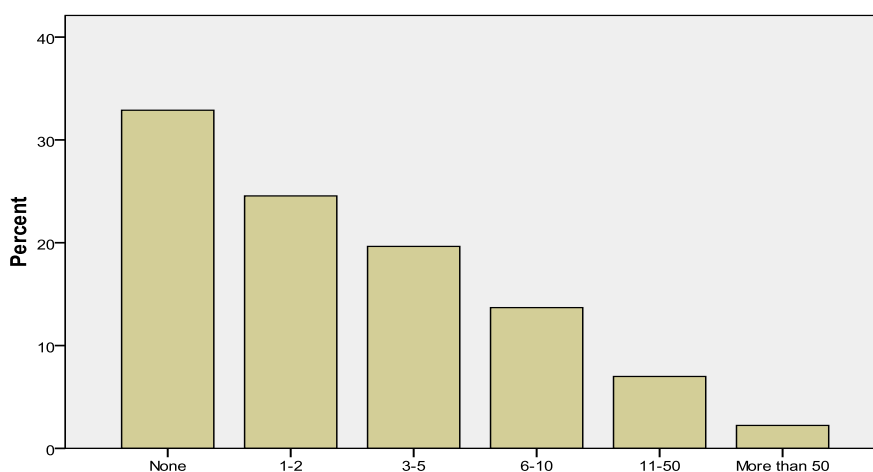
Figure 4.6: Number of Employees in the organisation.

*Functional Area*

The functional area covered people from Sales, Marketing, Finance and Human Resource. But Finance area had the most responses (246 of 649; 35.7%) followed by Marketing (114 of 649; 16.5%). 27.1% others included people such as, Consultants, Strategy, IT and Project Management.

Figure 4.7: Functional Area of the Job*Number of employees reporting directly to you*

It was observed that 32.1% (221 out of 672) of the respondents were operating independently. But at the same time 9% (62 out of 672) of the respondents had more than 11 people reporting to them.

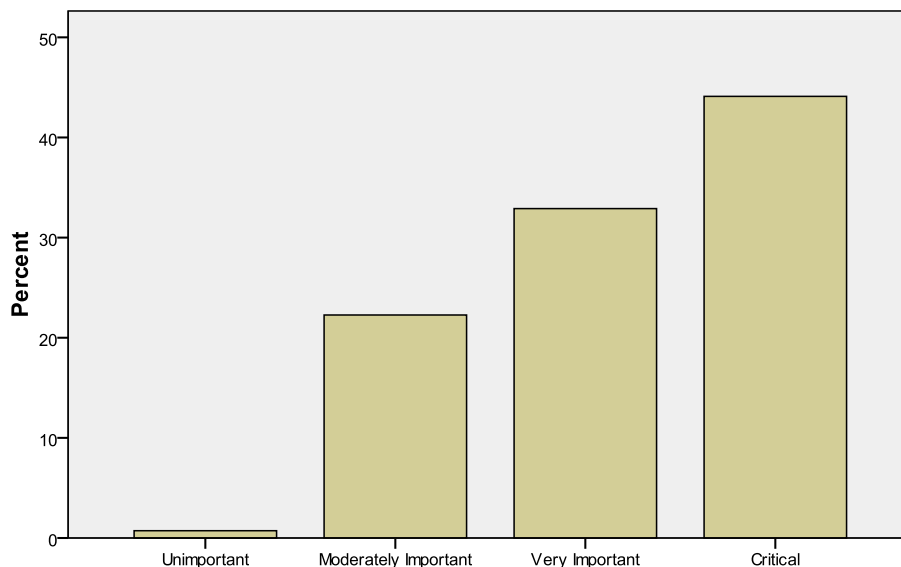
Figure 4.8: Number of Employees reporting to the respondent.

4.3 Spreadsheet Use in organisations

It was observed that the most used software package within organisations was Microsoft Excel with 99.4% (685 out of 689) of the respondents using it. This was then followed by Microsoft Access (162 of 689; 23.5%), VBA (Visual Basic for Applications) (56 out of 689; 8.1%), Oracle (50 out of 689; 7.3%), Lotus123 (13 out of 689; 1.9%) and finally Quattro Pro (6 out of 689; 0.9%).

When asked about the importance of spreadsheets within their individual jobs, it was observed that 77% (529 out of 687) of the respondents thought that spreadsheets are very important or critical to their job. This figure confirms that spreadsheets play a vital role in day to day activity.

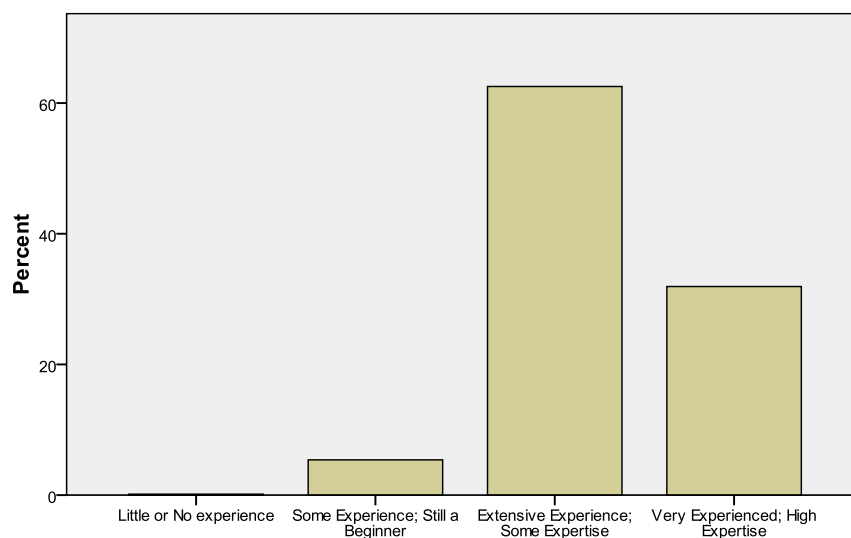
Figure 4.9: Importance of Spreadsheets on Job.



In response to the question related to experience of the respondents with spreadsheets, it was noticed that only 31.8% (219 out of 686) of the

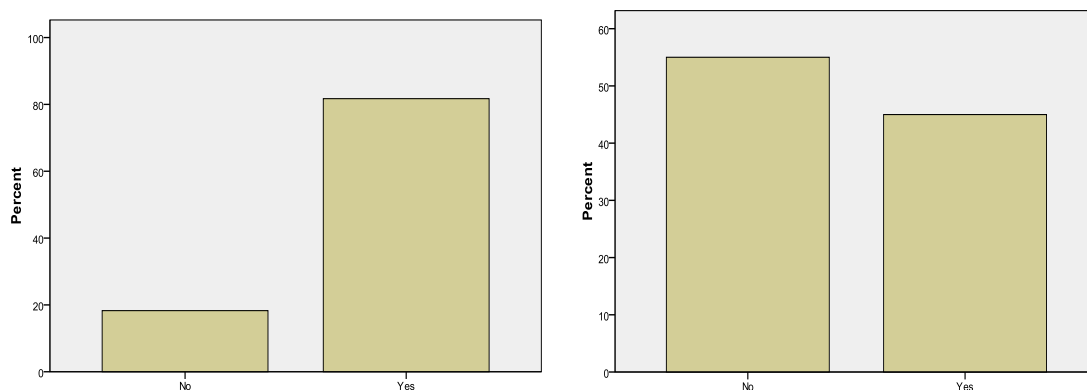
respondents thought they had high expertise and high experienced. The key observation within this response was that 62.3% (429 out of 686) of the respondents said that they had extensive experience but only had some expertise. This clearly shows that the exposure to spreadsheets is extensive, but the expertise gained over years is low. This raises the need for training in order to improve the expertise in line with the extensive use of spreadsheets.

Figure 4.10: Experience in Spreadsheets



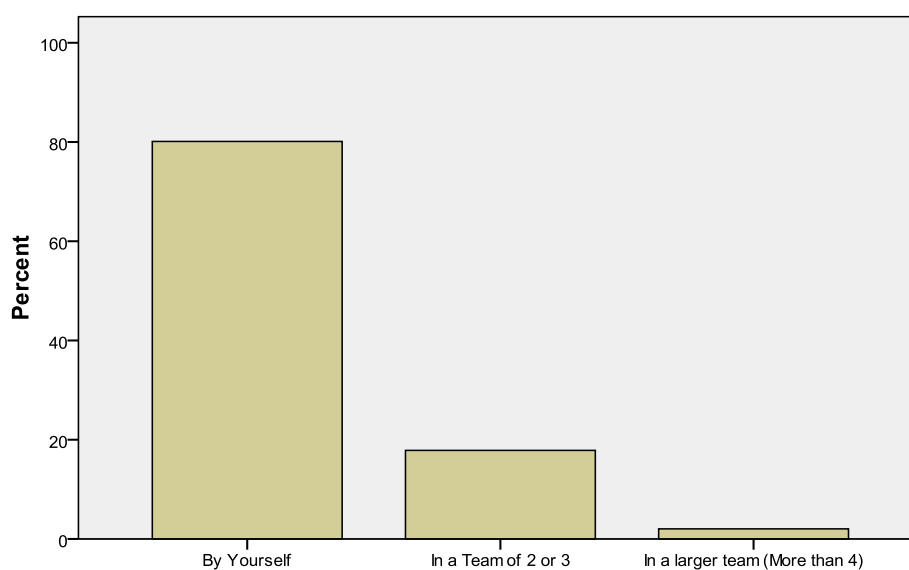
81.7% (563 out of 689) of the respondents had some training in spreadsheets, but out of these more than half (379 out of 686; 55%) did not have it in a formal class room instruction. This implies that it was either autodidactic or on-job training.

Figure 4.11(a): Any training? AND Figure 4.11(b): If yes, was it Classroom based?



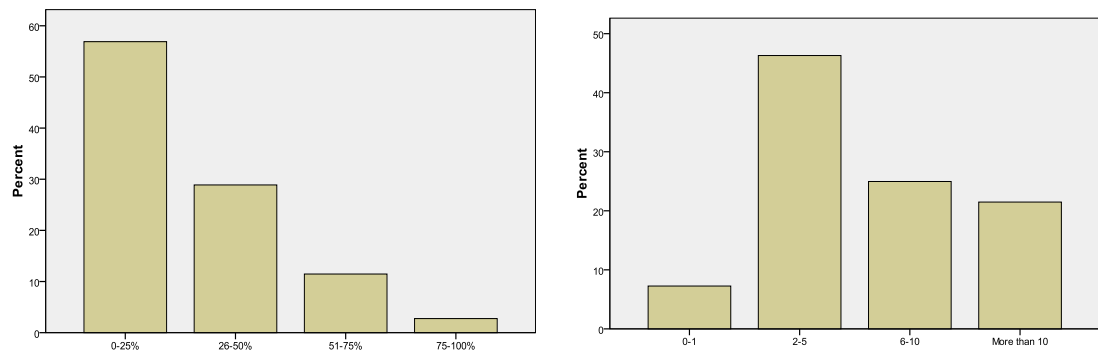
The majority (552 out of 689; 80.1%) of the respondents worked on their own when working on spreadsheets. This clearly indicates lack of peer review or collaboration with other employees. If the spreadsheets developed under this environment are mission critical then this raises the concern of accuracy in them.

Figure 4.12: Work on spreadsheet



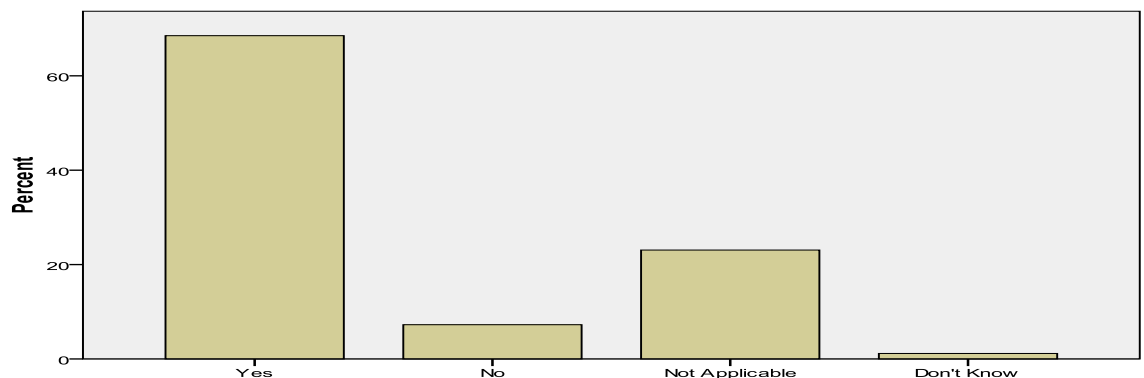
14.3% (98 out of 689) of the respondents spent over 50% of their time on spreadsheets. 92.8% (639 out of 689) worked on more than one spreadsheet per week, and of this number, 21.5% (148) worked on more than 10 spreadsheets per week. It is clear that most respondents worked on multiple spreadsheets through the week.

Figure 4.13(a): Percentage of time spent on Spreadsheets **Figure 4.13(b)**
Number of Spreadsheets you work on



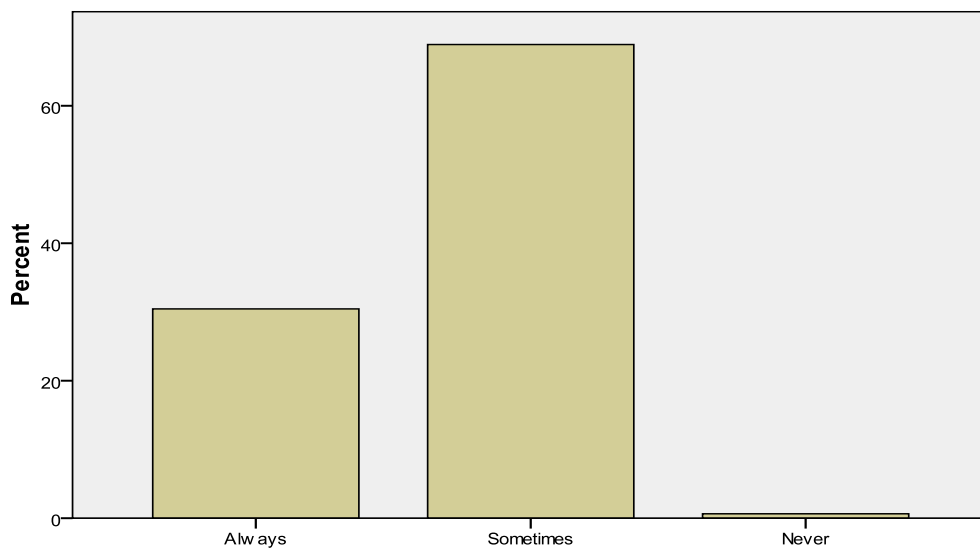
Another key observation from the questionnaire responses was that over two-thirds (472 out of 689; 68.5%) of the respondents said that their spreadsheets were used to develop recommendations for others.

Figure 4.14: Are spreadsheets used for developing recommendations?

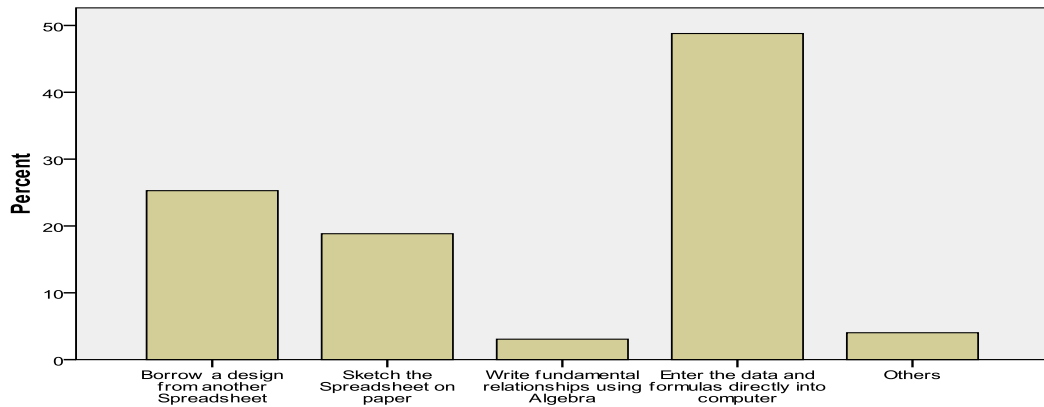


The majority (619 out of 689; 89.8%) of the respondents were creators of spreadsheets out of which only 27.6% (190 out of 689) of the respondents always created it from scratch. It is clear from this response that the spreadsheets are often acquired from others or previously self-created spreadsheets are modified.

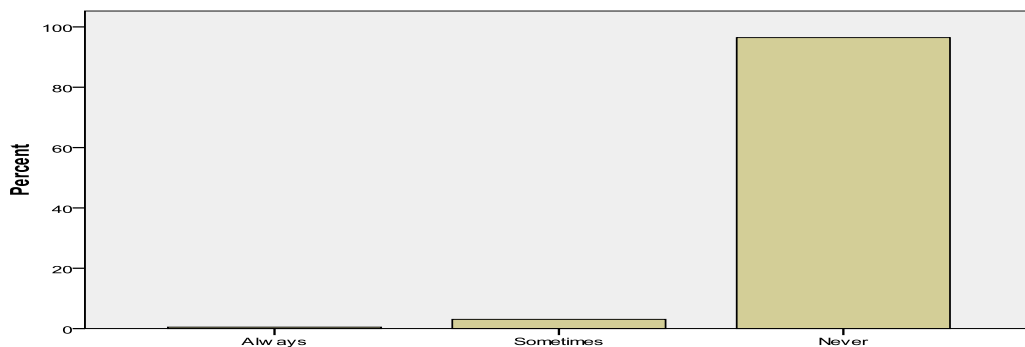
Figure 4.15: Are spreadsheets created from scratch.



A significant percentage (303 out of 621; 48.8%) of the spreadsheet creators started with directly entering data and formulas onto the spreadsheet with no previous preparation (such as sketch spreadsheet on paper or writing fundamental relationships using algebra). This is worrying considering a previous response, where it was mentioned that the majority of respondents did not think they were experts in spreadsheet use.

Figure 4.16: First step in Spreadsheet creation.

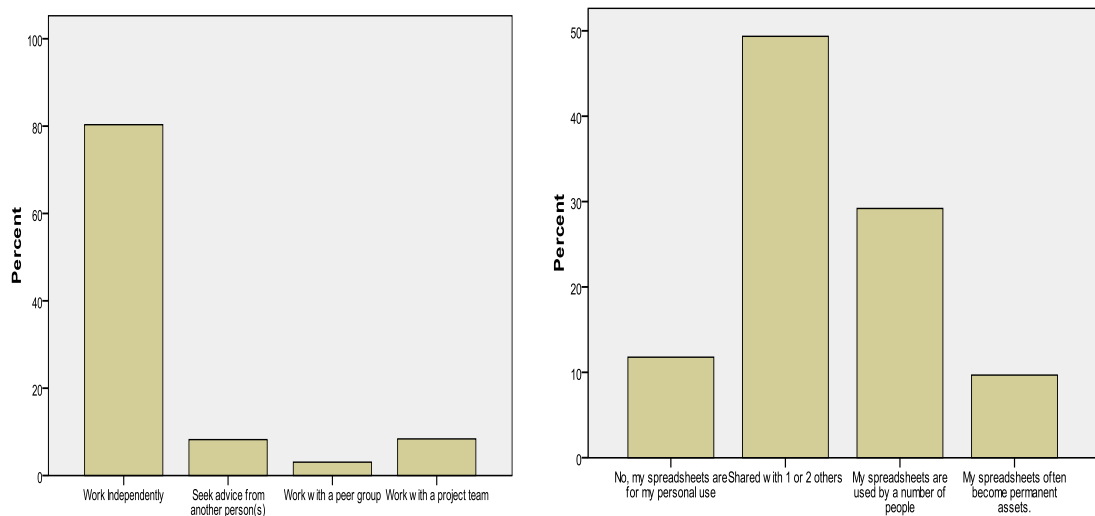
Another observation is that most of the respondents (589 of 620; 86%) never used software development methodologies when developing spreadsheet models. The figure was 87%. It was interesting to see that with spreadsheets being critically important to organisations, developers not having high expertise and with most of them self taught, there was still no structured approach to spreadsheet creation.

Figure 4.17: Use of Development Methodology in creating Spreadsheets

When developing spreadsheets most of the respondents (498 out of 620; 72.3%) work independently. A significant percentage of the respondents (547

out of 620; 79.4%) revealed that they share their spreadsheets with others. It was also revealed that one in three spreadsheets thus developed are shared with more than one person.

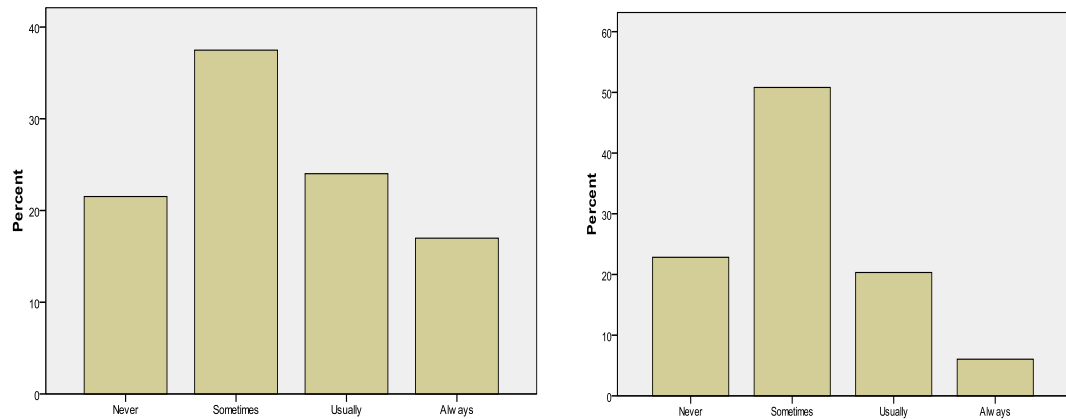
Figure 4.18(a): Work on Spreadsheets alone or with others? Figure 4.18(b) Are Spreadsheets shared?



Despite the fact that most of the spreadsheets, even if developed independently, are shared with others, spreadsheet testing is not common practice, with only 16.8% (116 out of 683) of the respondents saying they always test spreadsheets. A similar response was noticed when asked about documentation. It was observed that only 6% (41 out of 679) of the respondents systematically do spreadsheet documentation, with 72.6% (500 out of 679) doing spreadsheet documentation either sometimes or never. This creates another worry, as spreadsheets developed without structured methodology, without testing and with no documentation are being shared with others.

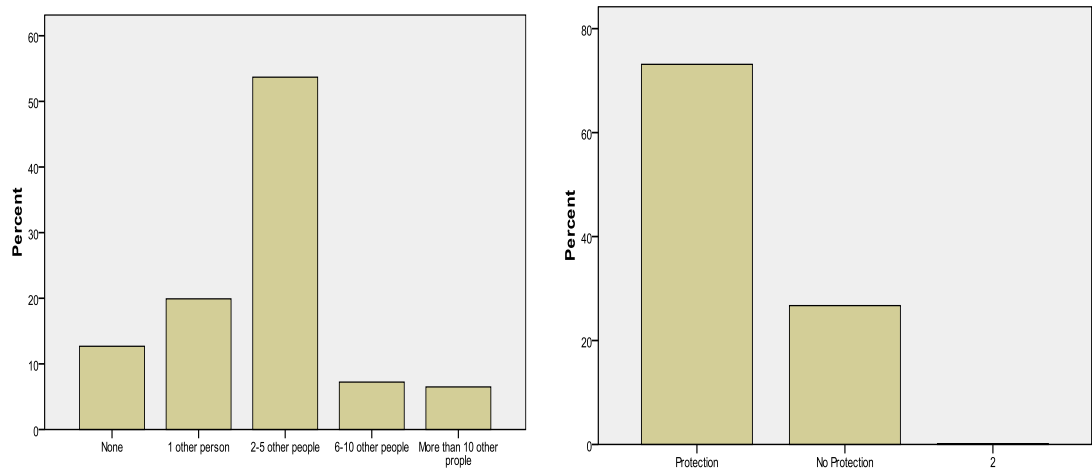
Therefore it is very likely for the errors and impacts of these errors spreading within the organisation.

Figure 4.19(a): Spreadsheet Testing and Figure 4.19(b) Documentation



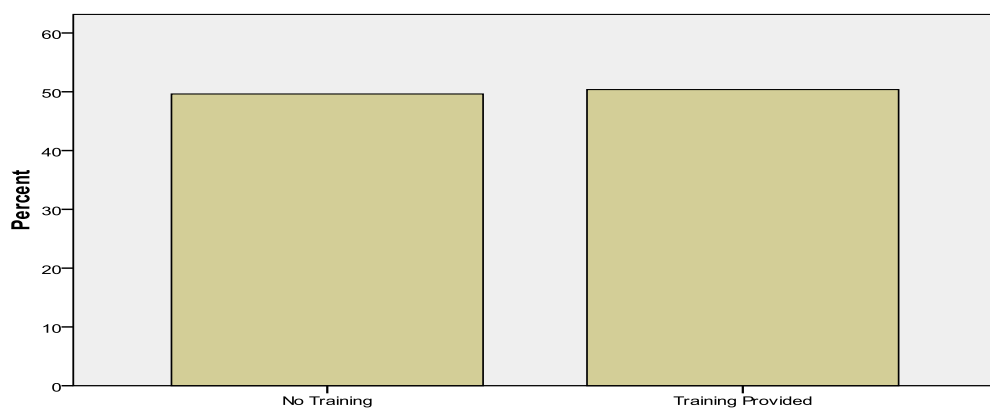
When asked about how many other users are there for a typical spreadsheet they use, it was interesting to see that only 12.5% of the respondents said that they were the sole users of these spreadsheets, whereas everyone else said that there were other users using the same spreadsheet. 52.85% of the respondents said that there are about 2-5 other people using that spreadsheet. Considering the extent to which spreadsheets are used by others most of the times, it was interesting to see that 26% of the respondents did not protect their spreadsheets.

Figure 4.20(a): Spreadsheet used by others and Figure 4.20(b) Any protection?



Almost half the respondents (48%) said that there was no training provided by organisations for spreadsheet development or use.

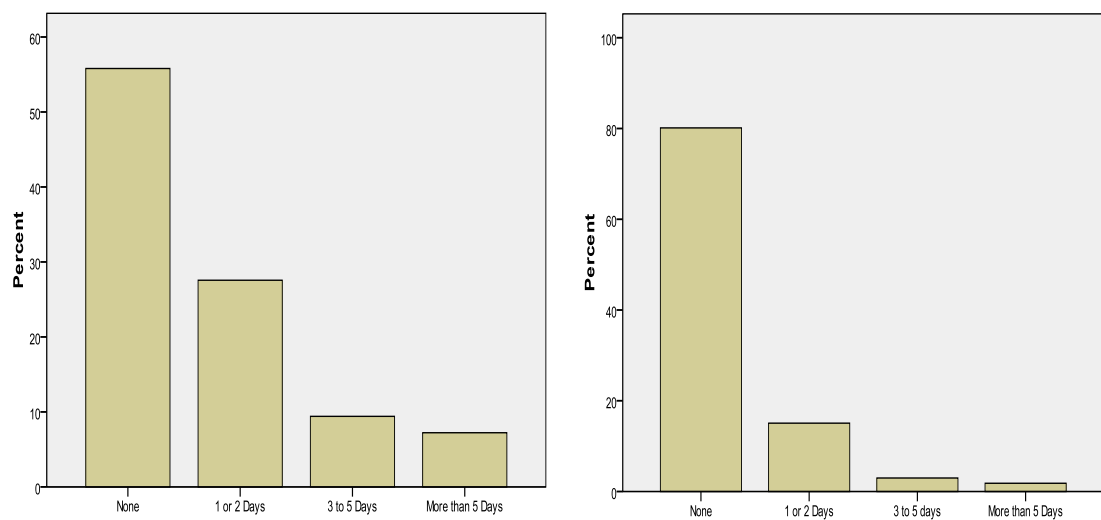
Figure 4.21: Spreadsheet training by organisation



When this aspect was explored further it was revealed that out of the ones who said that there was training offered in the organisation, 70.2% of the

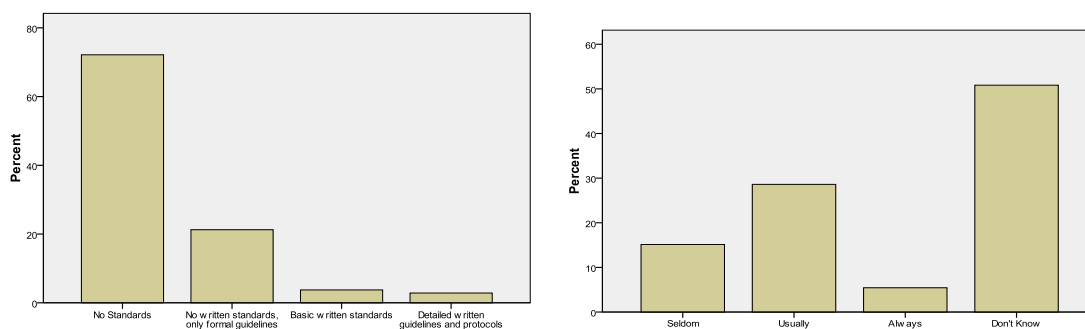
respondents said that the none of this training was used, which raises some concerns, considering that most respondents thought they had extensive experience with low expertise (refer figure 4.10).

Figure 4.22(a): Training offered? And Figure 4.22(b) how much of this is used?



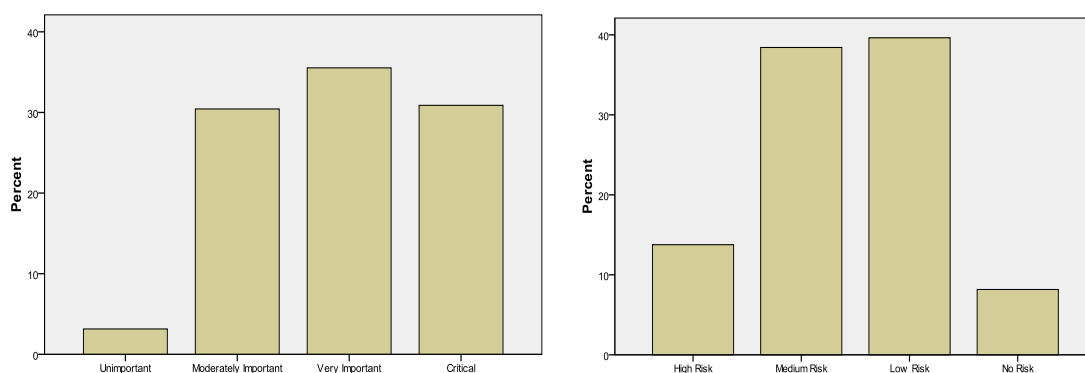
The majority of the respondents (70%) said that there were no standards or policies for spreadsheet use within organisations. Of the responses where there were some kind of standards, it was seen that almost half (50.8%) of respondents did not know if the standards were followed or not.

Figure 4.23(a): Any organisational standards and policies for Spreadsheets use set? And 4.23(b) If 'yes' are they followed?



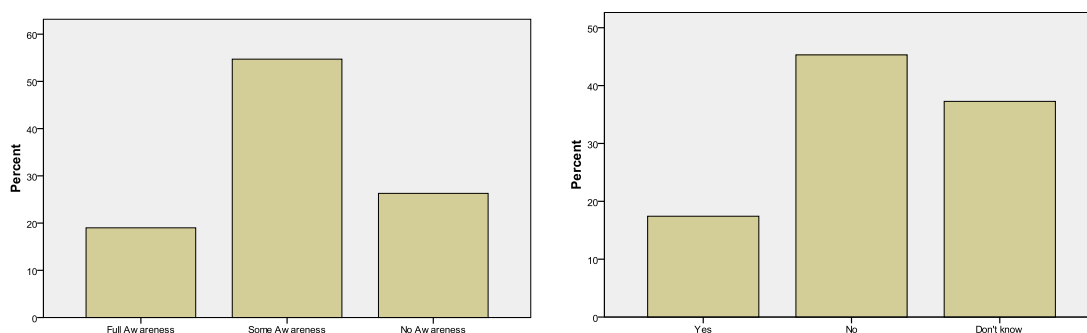
After asking the individuals the level of importance of spreadsheets in their day to day activity, it was asked if the spreadsheets were important to organisation as such. It was revealed that 64.3% of the respondents thought they were very important/critical. But when asked about the level of risks that spreadsheets pose to the organisation, the responses were more evenly spread with 51.1% respondents stating that they are medium to high risk.

Figure 4.24(a): Importance of Spreadsheet to organisation and Figure 4.24(b) perceived risk.



The respondents were asked if their organisation was aware of the risks associated with spreadsheets. It was interesting to see that only 18.1% of the respondents said that their organisations were fully aware. 25.1% of the respondents said their organisations were not aware at all. The author further asked them if Sarbanes Oxley legislation changed the level of awareness of spreadsheet risk within the organisation. The majority of them either did not know (35.7%) or said that it did not have any effect (43.4%).

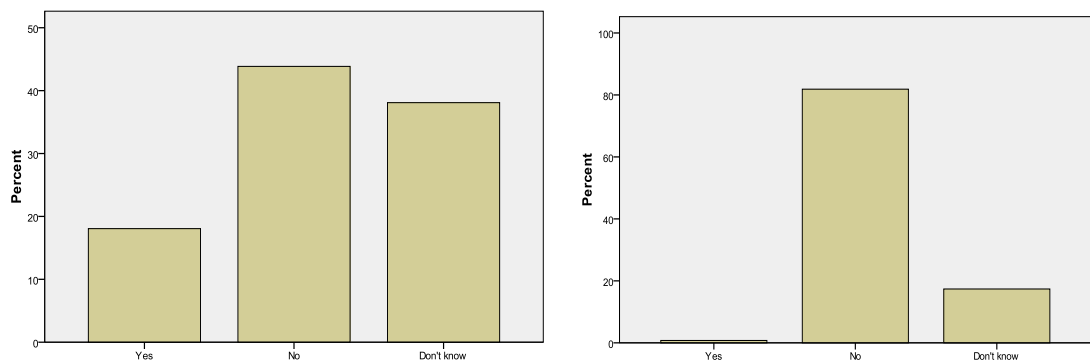
Figure 4.25(a): Awareness of Risks and Figure 4.25(b) Did SOX make any difference?



Once it was known about the risks, it was asked if there were any risk mitigating strategies at all in place. A majority (78.3%) of the respondents either confirmed that there were no such strategies (41.9%), or did not know about any such strategies (36.4%). It was interesting to compare this with a previous observation about awareness of risks as despite being having some awareness of the risks associated with spreadsheets, there was nothing done to mitigate these risks, which clearly enhances the importance of this study. Another

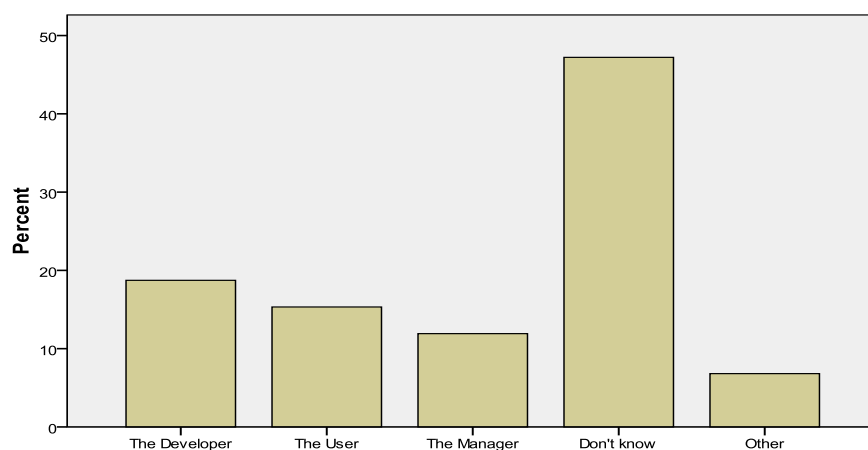
question asked was if they used any software/package for spreadsheet audit. Only negligible (0.7%) number of organisations actually used it.

Figure 4.26(a): Do you have spreadsheet risk mitigation strategies and Figure 4.26(b) Use of Audit Packages



In order to see who takes responsibility of such risks within organisation, it was asked who would be responsible for such risks, and once again almost half the respondents (44.3%) did not know who is responsible. The ones who were mentioned as being responsible were either the developer (17.6%) or the manager (14.4%).

Figure 4.27: Person responsible for Spreadsheet Risks in Organisation.



4.4 Relationships

In this section the data will be analysed to answer a series of questions.

4.4.1 Does Use of spreadsheets vary by Sector

As a part of the analysis it was investigated if some of the observations could be generalised across all sectors covered. These observations are discussed below.

The importance of spreadsheets in day to day activities was not related to the sector ($\chi^2 = 25.145$ and $P = 0.241$). Therefore observations for importance could be generalised across sectors. The creation of spreadsheets from scratch does not change with sector ($\chi^2 = 18.928$ and $P = 0.168$). The use of development methodologies does not change with sector ($\chi^2 = 9.019$ and $P = 0.830$). The sharing of the spreadsheets exists within organisations irrespective of the sector ($\chi^2 = 24.847$ and $P = 0.254$). Spreadsheet testing does not change with sector ($\chi^2 = 24.187$ and $P = 0.284$). The protection of spreadsheets does not change with sector ($\chi^2 = 10.469$ and $P = 0.727$). The standards and policies within organisations do not vary with the sector ($\chi^2 = 28.644$ and $P = 0.123$).

4.4.2 Does the use of spreadsheets vary by functional area?

An analysis similar to the previous section was done for the functional area. The spreadsheets creation from scratch does not vary with the functional area ($\chi^2 =$

16.635 and $P = 0.410$). The use of development methodologies for designing spreadsheets does not change with functional area ($\chi^2 = 16.713$ and $P = 0.404$). The sharing of spreadsheets does not change with the change in functional area ($\chi^2 = 26.346$ and $P = 0.336$). The practice of protecting spreadsheets does not change with the change in functional area ($\chi^2 = 7.390$ and $P = 0.965$).

4.5 Summary and Key findings from the Quantitative Data

Most of the respondents were male (76.3%). The range of organisations, size and sectors covered within the questionnaire are widespread. The importance of spreadsheets within a job is significant irrespective of sector or functional area. The people who are spreadsheet users and developers are very much experience driven, but lack expertise. In general it was seen that the training for spreadsheets is not very high in priority within organisations and individuals. Within the organisations that offered such training, the take up on that was still low. Sharing of spreadsheets with others within the organisation is a common practice irrespective of the sector or functional area and a significant time was spent on it, but in relation to this it was interesting to see the lack of protection within spreadsheets. The overall approach towards spreadsheet development is very casual, because most of the respondents, when creating spreadsheet models, started by directly entering data onto the computer without thinking of using any development methodologies. Another interesting finding was the lack of testing and documentation irrespective of the sector, despite the fact that they are so important within organisations. The awareness of compliance and

regulations like SOX was low within organisations, irrespective of the sector and the same observation was noticed irrespective of functional area.

4.6 Findings from other studies done within the Spreadsheet Interest group within UWIC

Altogether there were three studies carried out within the Spreadsheet Research Group within UWIC. All of them were done as M-level dissertations within UWIC. The third study was supervised directly by the author and the student used the questionnaire developed by the author in collaboration with Tuck Business School. The author has also included within this section a study, which was done by a member of EUSpRIG Group, in the City of London in 2005 (and later updated in 2009). The findings from this study were considered to be very relevant to the study in hand; therefore it has been included within this section rather than the literature review. The four studies have been presented below with a brief introduction, methodology and key findings.

4.6.1 Study 1: X Corporation:

This is the first study, carried out by Karen Fernandez (2003) as her MSc dissertation. The study was carried out in a large US-based trans-national manufacturing organisation with a significant UK operation referred to here as X Corporation. The title of the dissertation was 'Investigation and Management of End User Computing Risk. The aim of the dissertation was to compare the findings and conclusions of previous studies against the experiences of the X Corporation's EUC developers.

Methodology:

In this study the information gathered related to the views and perceptions of X Corp Staff who are involved in EUC development. Semi-structured Interviews were selected as a method of information gathering. Preliminary interviews with departmental managers were undertaken. Interviews were kept as informal as possible, with reassurances of anonymity and confidentiality given. The discussions were allowed to flow freely in order to gather fuller and wider information.

Key Findings:

Fernandez soon realised that spreadsheets were the most significant EUC activity within the organisation. As she highlighted, *“the number of tools employed is very small, limited to primarily Microsoft Excel and one super-user's use of Cognos Impromptu”* (p46).

X Corp's perceived usage of EUC was found to be at 51% of the overall software usage, albeit this was based on very approximate figures. In general it was found that EUC development is of significant importance to the users, and is used widely throughout the organisation. The departments that deal with strategic/tactical decisions involving ‘analysis’ tend to be highly dependent on EUC developed applications. All the users consider Excel to be an extremely quick and useful tool, providing them with all the functionality they need. She also found that although the tool skill and knowledge of the developers is very high, their system development methods knowledge is very low. Although they believe their applications to be of good quality, the existence of examples of

potential risk incidents puts this good quality into question. She concluded that EUC is of strategic importance.

4.6.2 Study 2: Y Trust

This study was conducted by Chris Gosling (2003) as his MBA dissertation. The title of the dissertation was, 'To what extent are systems design and development techniques used in the production of non clinical corporate spreadsheets at a large NHS Trust'. Gosling (2003) examined the use of spreadsheets across various departments in a large UK National Health Service (NHS) Trust, referred to as the Y Trust. One of the main aims of the dissertation was to establish a key management requirement of the Information Management and Technology Department at the Y Trust in providing evidence of the use of spreadsheets.

Methodology:

Gosling deployed a Quantitative method of information gathering, distributed questionnaires via e-mail and hosting the questionnaire on-line to be accessed remotely. Due to the potential for emails to branch out to a wider community than originally intended, it was decided that emails containing the attached questionnaire would be sent initially to each directorate (departmental) Head. The head then was asked to forward it to at least 10 members of their staff, who then forwarded the completed questionnaire to the researcher. The questionnaire comprised both open and closed questions with a variety of answer types. The question responses were in several formats including yes/no; scaled answers; multiple option answers; free text answers. Out of 253

individuals approached, the researcher received 119 responses, of which 16 had to be rejected for being incomplete or unanswered.

Key Findings:

The results showed some ambiguity in terms of the perception of the importance of spreadsheets to the organisation. On the one hand, respondents regarded their spreadsheets as vital to their work but then did not seem to understand just how *important* their spreadsheets are to the *organisation*.

Few respondents thought the information they processed using spreadsheets would be useful to senior management. In fact, very few were even aware that the information had the potential to be distributed beyond the trust boundary. This did not mean they were indifferent, as nearly all showed dedication and commitment to working with spreadsheets and were enthusiastic in providing data for research.

According to Gosling, most of the Trust's information management policies are driven by the need to support patient services through its technical processes. That spreadsheets form part of the underpinning of that support structure appears to have been overlooked. This introduces unacceptable risk to the Trust's business processes and ultimately compromises the provision of quality services to patients. The research showed that there was an *urgency*, to impress upon the Trust Board of the existence of a serious threat to patient services due to the absence of a formal spreadsheet policy, and to raise the awareness of the issues surrounding the current, unstructured reliance on the use of spreadsheets as a 'frontline' information system.

4.6.3 Study 3: Z Department

This study was conducted by Paul Janes (2005) for his MSc Dissertation. The title of the dissertation was, 'An Investigation of the Risks Associated with Spreadsheet Use within UWIC'. He investigated spreadsheet use within the Facilities Department (referred to as Z Department) of UWIC. The purpose of the research was to find out how, where, why, and by whom are spreadsheets used within organisations. This dissertation was supervised by the author.

Methodology:

The main methods of data collection were questionnaires. The group at UWIC prepared a joint questionnaire in association with Tuck Business School at Dartmouth College, USA. Tuck Business School hosted this questionnaire and the responses were then converted into spreadsheets and sent to UWIC for further analysis. The questionnaire was divided into 13 sections. The sections covered various aspects about spreadsheets ranging from Use, Creation, Testing, Documentation to Risk Management and Practices and Policies. A distribution list of 79 potential respondents created in Microsoft Outlook to facilitate the issue of the questionnaire by e-mail. Finally after two reminders 35 completed questionnaires were received.

Key Findings:

The key findings from the questionnaire were:

- It was not difficult to establish the usage of spreadsheets, as 85% of the respondents accepted that Excel is the key software they use on the job.
- A majority (65%) of the respondents highlighted the importance of spreadsheet to be 'very important or critical'. This made interesting reading against how users classified their experience with using spreadsheets. 48.6% felt they had some experience but were still beginners. Only 2.9% felt very experienced with high expertise.
- In the perception of the respondents the risk posed to the organisation is Medium to Low risk (80%), which when seen in the light of awareness of risk is on the lower side (78.2%).
- The key areas of spreadsheet use were found to be: To track data such as budgets, sales and inventories and to evaluate alternatives.

According to Paul Janes (2005, p104), *"the most significant risk was identified as the over reliance and trust users placed in using spreadsheets for corporate budget forecasting and setting"*. The figures held in these spreadsheets were discussed at meetings between Finance and Facilities, transposed to the corporate finance system (Agresso) and *"contributed to UWIC's bottom line figures. Worryingly, users felt the risk to UWIC was low"*.

4.6.4 Study 4: City of London

This was a study conducted by Grenville Croll (2005) in the City of London. The purpose of his paper was to give an overview of the uses to which spreadsheets are put in large organisations and major businesses operating within the City of

London. He took his work further in a paper published in proceedings of EUSpRIG 2009. The aim of the study was to investigate the reliance on spreadsheets within one of the largest financial markets. The findings were summarised in the paper titled, *“The Importance and Criticality of Spreadsheets in the City of London”*.

Methodology:

Professionals from large organisations were interviewed. The interviews were conducted through telephone under assurances of anonymity. The interviews lasted approximately half hour each. Field notes made contemporaneously evidenced the main points of the conversation. The sample consisted of 23 individuals from a range of roles including auditors, accountants, actuaries, bankers, directors, insurers, lawyers, quantitative finance specialists, IT specialists, regulators and other individuals playing significant roles in the City of London. Interviewees were informed that it was intended that each individual should characterise the uses of spreadsheets in their sector in terms of the people involved and their roles, the number of spreadsheets involved, frequency of use, their size, importance, significance or criticality. Significance or criticality could relate to finance, business opportunity, business risk, commercial necessity, fiduciary or legal duty, individual careers, health & safety etc.

He included some further discussions and email interaction with some organisations in the City of London in his paper published in 2009.

Key Findings:

It was found that spreadsheets are an integral part of the organisations. As highlighted in one of the interviews: *“Spreadsheets are integral to the function and operation of the global financial system”* (Croll, 2005, p4). When another respondent was asked to comment further, it was added, *“Agreed. In addition I would say that the majority of people who use the financial system are not appreciative of the role that spreadsheets play”* (ibid).

The extent of use of spreadsheets varies across the City of London. Within certain large sectors, such as Professional Services and Large Corporates, Financial Trading and Fund Management, Private Finance Initiative and Public Private Partnerships, spreadsheets play a role of such a critical importance that without them, companies and markets would not be able to operate as they do at present. Their use in certain sectors (such as financial markets, fund management, investment research and financial reporting) is relatively uncontrolled. In the worst instances (supported by interviewee evidence) the existence or use of spreadsheets is concealed by senior management. He highlighted that a ‘large bank’ was *“using a suite of several hundred spreadsheets to underpin the operations of one of its key lending departments. There was no evidence that any formal testing of these spreadsheets had taken place and at the time of writing they were uncontrolled”* (Croll, 2009, p6). Furthermore, *“A trading desk of a large foreign bank used spreadsheets as the basis for its derivative operations”*.

In the paper in 2009 he made an interesting revelation by discussing the role of spreadsheets in the collapse of the Jamaican Banking System. Lemieux (2002; 2005 cited by Croll, 2009, p8) claims that the “*Jamaican Banking system collapsed in its entirety in the late 1990s partly due to the use of spreadsheets and a consequent failure to manage and control them*”. It was revealed that Jamaican banks were heavily relying on spreadsheets as a part of management information and reporting framework. The spreadsheets, besides other things, were used for various purposes including: cash management, financial budgeting and control, analysing customer profitability, financial risk management, interest rate sensitivity analysis and foreign exchange management. Croll (2009) highlighted that the pattern of usage in Jamaica in 1990s is just a small ‘subset’ of the present pattern of usage in the City of London and other major financial centres. The key problems, discussed in the 2009 paper (p9), which led to the financial collapse in Jamaica were:

- **Individualistic naming of files:** *These idiosyncratic file names obscured the content and purpose of the files, divorced the files from the business process and the people creating them (particularly if an individual had left the bank), prevented easy access and made management reporting very difficult.*
- **Ad hoc assignment of storage location:** *Important files were stored on personal hard drives without any document management, backup or archiving.*
- **No Document Retention policy:** *Data was deleted at the whim of the individual so that banks financial positions could not be calculated accurately or even at all.*
- **Failure to preserve a link to the business context:** *This rendered spreadsheets meaningless as a background to a particular business decision.*
- **Inability to guarantee the authenticity and reliability of spreadsheets:** *There were no controls over how spreadsheets were archived and no effort was made to “lock” down their content as part of a formal archiving*

process. As a result, their integrity was seriously questionable, since anyone could have changed the content in the intervening period and audit trail controls were weak to non-existent.

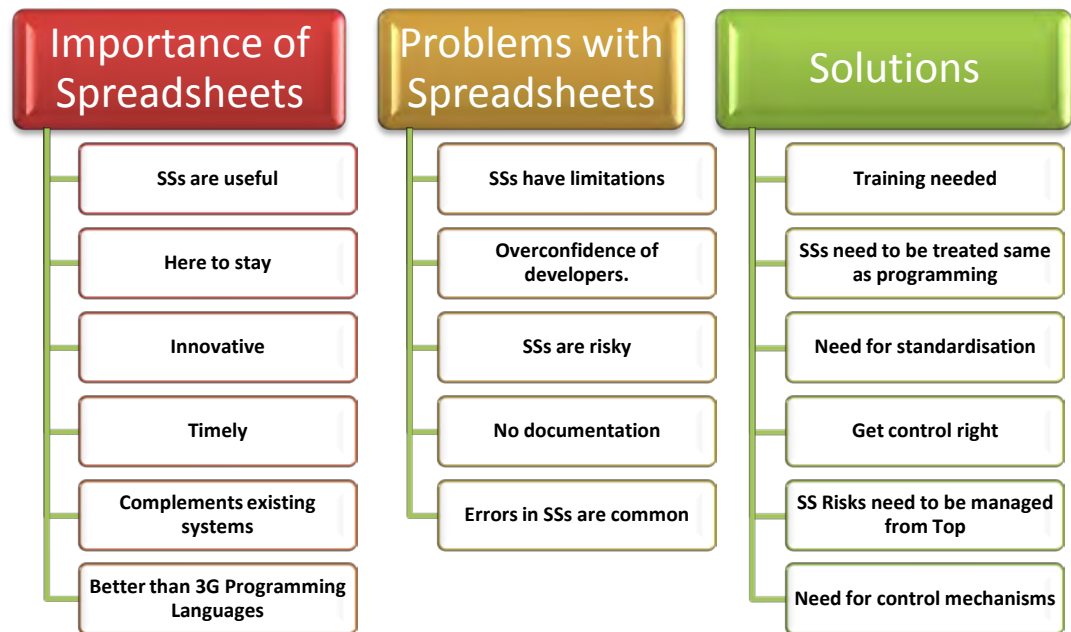
He further highlighted that it is highly likely that the limitations in spreadsheet management and control experienced in Jamaica during the late 1990s are now being experienced in the wider, global economy.

4.7 Analysis of the key findings from the online discussion on the expert forum of EUSpRIG.

This section highlights the analysis of unstructured data which was acquired in the form of an email discussion through EuSpRIG Yahoo Group (see Appendix 6). The participants in this discussion were experts in the area of spreadsheets consisting of practitioners and researchers. The method of analysis used for this was hierarchical data structure analysis. The three main themes that emerged in the discussion were put into four main categories

1. Importance of Spreadsheets
2. Problems with Spreadsheets
3. Solutions to the spreadsheet risk problem

Figure 4.28 Themes from the E-discussion experts forum (Refer Appendix 6).



This section shall be discussing the outcome within these categories.

4.7.1 Importance of Spreadsheets

It is clear that spreadsheets are an integral part of the organisations. This becomes even more significant within the financial domain. One of the themes that echoed through the discussion was that “Spreadsheets are here to stay”. They sit very nicely along side the corporate information systems within the organisations.

They (Organisations) also own the largest accounting systems....but there is always a need for just a few extra spreadsheets to handle the last items that live outside the system. Of course the systems catch up and those spreadsheets can be retired but then the world moves on and more spreadsheets appear.

A strongly expressed opinion was that it would be very difficult to get rid of spreadsheets from organisations.

We all recognise that the spreadsheet is here to stay and that it is a very powerful tool

I work with a Fortune 50 company who depends on spreadsheets for their very survival.

I agree that anyone who talks about eliminating spreadsheets on the scale of a lifetime or two is smoking dope – unless of course some unforeseen innovation we don't have today replaces them.

It was felt that spreadsheets have their own advantages due to flexibility and promptness in implementing calculations that are not readily available in other programming languages.

Spreadsheets have been so wildly successful that they are now being applied to complex applications...

...they (Spreadsheets) often provide a better way to implement computations than getting buried in programming conventions.

Ray Panko further stressed their importance comparing them with other Generation (3G) programming languages.

Frankly, except in special cases, I can't see 3G programming languages winning (from spreadsheets) too often, and even if a packaged program is used, learning to use it and doing ancillary calculations needs to be considered very carefully.

The key benefits of using spreadsheets that were highlighted were flexibility, timeliness, user-friendliness. It was also felt that use of spreadsheets can sometimes provide organisations with a competitive edge. If organisations rely

on the IT department to provide all the data and information then it will never be delivered on time.

Trying to stop people using spreadsheets is never going to work.

Nothing else can deliver the flexibility, user-friendliness and gentle learning curve that Excel does."

In some businesses you would also run the risk of losing the competitive edge of "timing" (first to market) if every bit of number crunching had to be developed under the auspices of the IT dept framework.

4.7.2 Problems with Spreadsheets

There were various problems associated with spreadsheets that were highlighted within the discussion. Spreadsheets are actually to an extent a victim of their own success. The ease of using spreadsheets on doing calculations on data has led them to be used on complex models. Despite their limitations their capacity is being stretched by the practitioners.

Spreadsheets have been so wildly successful that they are now being applied to complex applications that stretch their design concepts to the limit.

Top management is dependent on people with data who have high domain expertise (i.e. knowledge of finance) but low expertise on use of spreadsheets. Some people overestimate their ability to model spreadsheets. People with lower expertise will not be able to develop well structured spreadsheets.

The problems arise because the people building the models are not trained in doing so,

...there is a lack of due process in defining requirements, challenging assumptions then in creating, validating and testing

then documenting a model. Finally locking it down and auditing changes.

Sometimes the management assume that the people reporting to them can do Excel and spreadsheet skills are never checked in an interview.

Management often just assume that people can "do" Excel. When was the last time anyone actually got tested on their Excel skills as part of a job interview process?" The same person further added, I've recently been extended as an Excel "temp" at this Fortune 50 company because the manager who was supposed to be "Top Gun Excel Expert" has been learning so much from me...

Everyone just assumes lower-skilled (and lower-paid) employees can do Excel and these skills never really get checked at the interview stage.

One of the experts explained the lack of experience using the analogy of a playing piano.

If you give people pianos, not all of them will become new Horowitzes. Spreadsheets are like pianos. You can play simple melodies with one finger relatively easily, but you should not assume that you can play Beethoven's piano sonatas without extensive training including learning from the masters."

The power of spreadsheets is also another problem. One of the respondents even said that they are like a knife in the wrong hand.

Spreadsheets are like a knife in the wrong hands, they can have devastating consequences especially juveniles and those with handling inexperience.

Spreadsheets, as highlighted earlier, are often used because of their timeliness advantage. Sometimes this advantage can also be negative. Sometimes time pressure can cause errors to occur and the errors can sometimes be very costly. Timing causes another problem, which can be called the Timing – Documentation Dichotomy.

...some of the largest companies in the world have made mis-statements of billions of dollars in very recent years simply on the back of spreadsheets being used as part of financial reporting.

...the amount of time put into the development of a particular spreadsheet is often a function of how much pressure the creator is under to get the job done. This leads to a dichotomy. Things like documentation get left to the end and are often not done, if they were even considered in the first place.

We all recognise that the spreadsheet is here to stay and that it is a very powerful tool. But with the power comes the risk.

The following section will now highlight the possible solutions to the problems identified.

4.7.3 Solutions to the spreadsheet risk problem

The very first step towards finding a solution to the spreadsheet problem is to accept that developing spreadsheets is like programming. So it needs to be treated like mainstream system development. Developing complex models will need specific training.

Even if many people do not think so, designing spreadsheets IS programming.

There are many vendors who are trying to help by developing technical solutions, but they are mainly detection and rectification/prompting solutions. There seems to be a need to develop a best practice guide for use of spreadsheets. But at the same time it is acknowledged that different organisations will have different best practices.

...lack of a publication called "best spreadsheet practices"

Since organizations (and their individual departments) are different so too are their best practices. Some want to make integrity part of user behaviour. Others want it to be remotely monitored.

There is extensive research on going in the field. The need for research in the area was clearly identified. It was said that the approach to spreadsheets needs to be formalised, but it was noticed that this might impact the timeliness advantage of spreadsheets. Therefore too much control might not be a good option.

One suggestion was that the way to manage the risk is to have a more formalised process around the development of spreadsheets that includes analysis, documentation, testing, validation and access control

...some of these procedures will have an impact on the time it takes to create the spreadsheet and for some people that will be unacceptable and they will simply ignore the more formalised framework and go back to their old ways.

The approach to the managing risks related to spreadsheets needs to start from top management and someone needs to take the responsibility of overlooking the controls imposed. The controls should not really kill the sheer flexibility of the spreadsheets.

So is it more productive to focus on managing the spreadsheet risk from "above" by having IT or some other oversight group...check things like broken links and other risky elements of the spreadsheet itself.

Spreadsheets being the powerful tool that they are, they need to be monitored and controlled. This will only lead to reduced number of errors and enhance their effectiveness and lower the risks associated with them.

The old adage of bad workmen blaming their tools is as true as ever in this case. So let's stop running down the good old spreadsheet and instead devise tools and practices to lower error rates!

Properly monitored spreadsheet is a very powerful way to empower individuals to be creative. I believe its then up to management to "manage" the risk that the spreadsheet presents IF it is subsequently used in any way that can add to the risk profile of the entity concerned.

The above discussion clearly highlights the need for the research in the area, which clearly supports carrying out of this study.

4.8 Summary

The questionnaire survey highlighted that spreadsheets are integral to the day to day function of the organisations. They are considered to be strategically important entity of the organisations and are used in decision-making or feeding information for decision-making. End users feel fairly confident with the models they produce despite the fact that they do not consider themselves to be experts. They have not had any formal training, they do not use any structured methodologies, they rarely test the models created rigorously. The general awareness of risks associated with spreadsheets is low, and clearly there are no policies or procedures to mitigate the risks. The likelihood of impact of errors within spreadsheets spreading across organisations and into decisions based

on these models is high, which is evident due to the level of sharing of the spreadsheet models. Most of the observations could be generalised across sectors and across functional areas. These observations raise the significance of the risks associated with spreadsheets.

The finding from the secondary case studies was no different. The key reason for the use of spreadsheet is because they are quick, innovative and extremely useful tool and actually complement the existing systems. The domain knowledge (i.e. finance, operations, business forecasting etc.) of the users and developers is very high but their knowledge of system development methodologies is low. Although they believe their applications are of high quality, the existence of examples of potential risk incidents and error rates put this quality into question. It was clear that there was an urgency to raise the awareness of the issues surrounding the unstructured reliance (refer study on Y – Trust) on use of spreadsheets as ‘frontline’ information systems.

Spreadsheets are clearly *here to stay*. They need to be treated as mainstream information systems. The need for research into this area is clearly identified. There is definite need for a formal, structured and standard approach towards spreadsheet risks. The only concern is *not* to discourage its use and also not to affect the timeliness and flexibility advantage of spreadsheets. The initiative needs to come from the top management. Therefore the approach needs to be widely understandable and should be flexible for different type of organisations.

The following chapter shall now develop and propose a model for categorising spreadsheet use incorporating risk. This model will assist in prioritising the use

on the basis of risk, which can then be used to develop the framework for mitigating risks associated with spreadsheets.

CHAPTER FIVE

DEVELOPING A RISK MODEL TO CATEGORISE SPREADSHEET USE

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Chapter 5: Developing a Risk Model to Categorise Spreadsheet Use

5.1 Introduction

This chapter will highlight the key findings from Objective 3: *Investigate the use, importance and risks associated with spreadsheet within organisations and develop a model for categorising spreadsheet use incorporating risk*. As highlighted earlier (see Research Methodology Chapter, Section 3.8.2) this comprised two case studies. The purpose was to develop a model for categorising spreadsheets incorporating risk. The chapter commences with proposing three alternative models based on the first case study, which is then followed by a comparison of the three models and finally the author summarises the general observations from both case studies and elaborates the final model proposed.

Case study 1 was done in the Accommodation Department in UWIC. This case study led the author to propose three possible categorisation models. These models were presented at the INFORMS (Institute for Operations Research and Management Sciences) Conference in Pittsburgh, USA in 2006. The feedback from the conference was also incorporated within the evaluation. The three models were then compared and eventually one final model was chosen. Case study 2 was then used to refine the model and see if the model were acceptable

to other organisations. The Finance Department in UWIC was used for this second case study. This case study was used to verify and refine the model proposed. The three models, their comparison and the final model was presented at the EUSpRIG Conference 2007 at University of Greenwich, UK. The author received a prize for '**Best Academic Paper**' at this conference. The final model was also presented at the INFORMS Conference in Seattle, USA in 2007, where the author was invited to present and to Chair a session in the conference. The feedback received in this conference has been incorporated towards the end of the chapter. The suggestions made at this conference were only made to make the model more acceptable from a pragmatic perspective, which is in line with the overall research approach followed throughout the research i.e. Pragmatist Approach.

The data gathered through interviews in the case study departments was analysed to identify the spectrum of use of spreadsheets within the department. The models proposed are based on conducting in-depth one-to-one interviews (face-to-face) of all the key personnel involved with development and use of spreadsheets within the department. All the interviews were recorded and then transcribed and analysed. The interviews and themes for case study 1 are discussed in Appendix 4 and for case study 2 are discussed in Appendix 5.

5.2 Alternative models for categorising Spreadsheet Use:

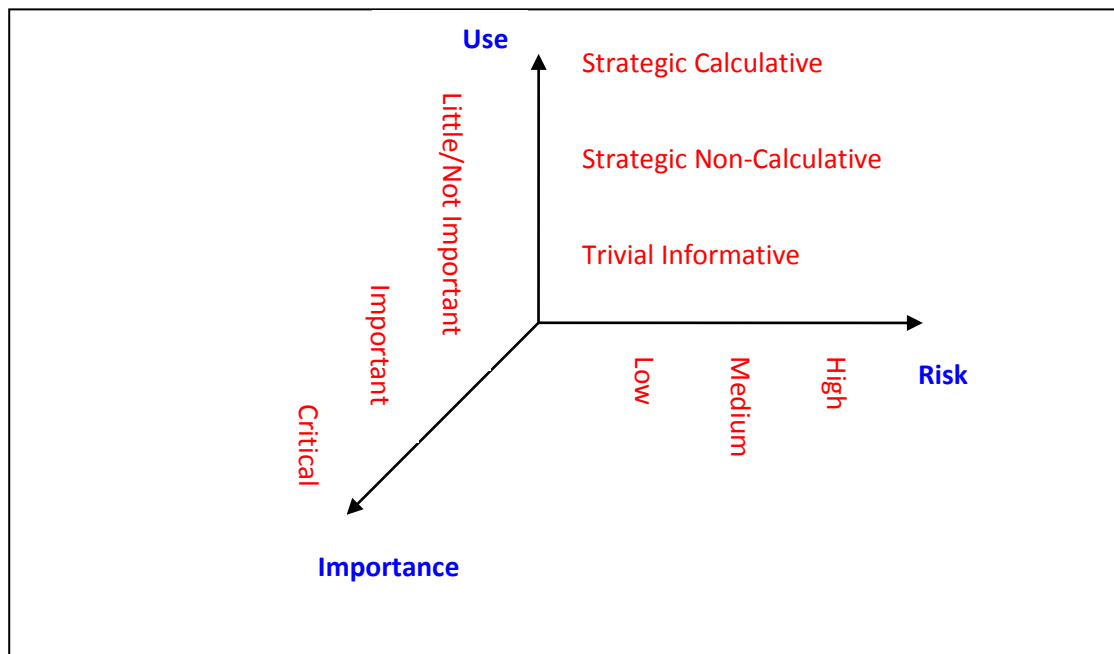
As highlighted in the Appendix 4, there were 123 themes identified through the transcribed interviews which could be divided into two broad groups. The first group was related to general observations related to spreadsheets (which will be elaborated on in section 5.4) within the case study, which confirmed some of the observations highlighted in chapter 4 and the literature review. The second group of themes was related to actual use and importance and thus used to define the dimensions and categories for each dimension for the models. The three possible approaches to defining the dimensions led the researcher to propose three different models.

Spreadsheets were an integral part of the case study department. The information stored within these spreadsheets was either directly used for decision-making or fed to decision-makers. In one extreme example they were used for designing basic paper forms or data stores. At the other extreme they were used for budgeting and forecasting which was for a more strategic use of spreadsheets. The other observations which are in line with the findings of Objective 2 are that there was general lack of training within the users for use of spreadsheets. Most of the users were self taught and had high level of confidence in their capability to design spreadsheet models. The spreadsheets were often shared and there was in general lack of version control, protection, testing, and documentation, which is in line with the observations from the questionnaire data in chapter 4. There were no compliance procedures related

to spreadsheets, yet they were used either for decision-making or feeding information for decision-making. It was observed that in general reliance on spreadsheets was high as all the interviewees stated that spreadsheets are quick and easy to use. One interesting observation was made when looking at spreadsheets within the department. The spreadsheets coming from the Human Resource Department were usually protected and the ones from the Finance Department were not. The general tendency was that they were more careful if the models were complex or when they were dealing with large figures. The following sections shall now highlight and discuss the three proposed models.

5.2.1 Model 1:

Figure 5.1: Model 1



Dimensions for Model 1:

- Use: The categories for this dimension of the model were based on the type of use of the spreadsheet. The use of spreadsheets within the department was significant. They were mainly used as a data source. Some of the employees also used complex models, for budgeting and forecasting. Therefore the spreadsheets could be classified as being 'trivial' data sources (for example, some of the respondents used it just to design basic forms and to maintain contact details etc.; see Appendix 4) or 'strategic' spreadsheets, which were used within the decision-making framework and tracking crucial information for smooth functioning of the department. Further analysis of the interviews revealed that within the strategic spreadsheets, there were calculative (the spreadsheets used for budgeting and forecasting) and non-calculative spreadsheets (for example, The UWIC Rider Bible which was used for recording and tracking the details of the student passes for UWIC Bus service and was used to settle records with Cardiff Bus Service). Therefore the first model had three categories within use.
 1. Trivial Informative
 2. Strategic (Non Calculative/ Informative)
 3. Strategic Calculative.
- Importance: This dimension was based purely on reliance on the information contained within the Spreadsheet. The respondents mentioned that certain information within the spreadsheets was for their personal use and reliance on them from a work perspective was not very

significant as this information was backed up as paper records.

Therefore the three categories proposed:

1. Not important/ Little Important
 2. Important
 3. Critical
- Risk: For this dimension the conventional categorisation was used (See section 2.6 in the Literature Review). Any definition of risk is likely to carry an element of subjectivity, depending upon the nature of the risk and to what it is applied (Riabokon, 2004). As such there is no all encompassing definition of risk. Chicken & Posner (1998) acknowledge this, and instead provide their interpretation of what a risk constitutes:

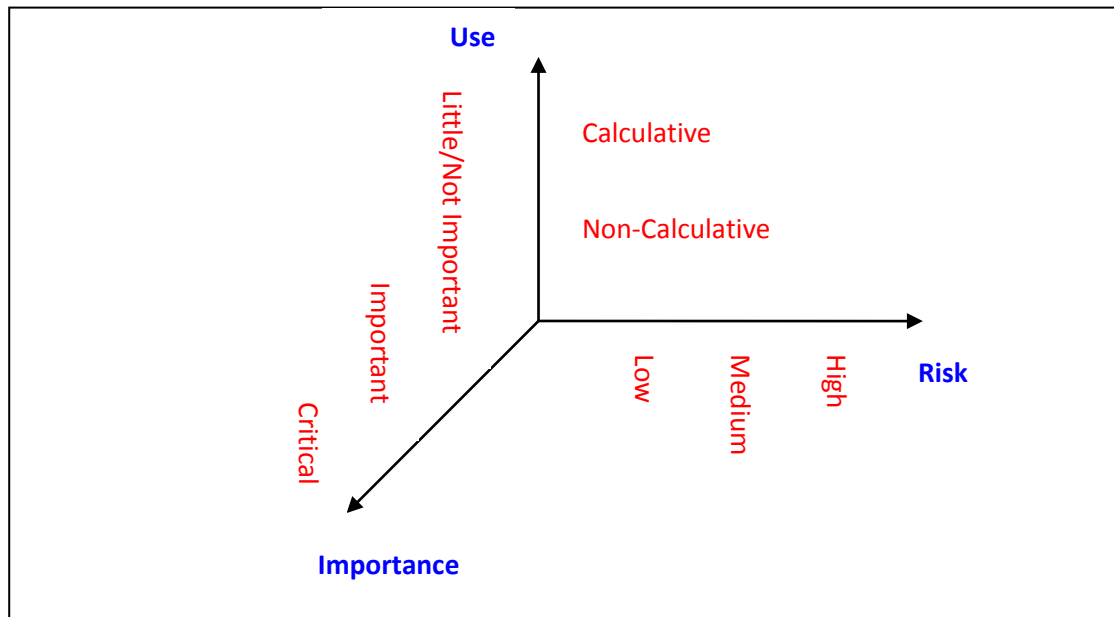
Risk = Hazard x Exposure

They define Hazard as “... *the way in which a thing or situation can cause harm,*” and Exposure as “...*The extent to which the likely recipient of the harm can be influenced by the hazard*” (*ibid*). Therefore risk in this case can be assessed on probability of information being incorrect or erroneous and the extent of problems that can be caused by it being erroneous. The problems or the loss can be financial, operative or administrative. Risk, therefore, is measured in terms of impact and likelihood. The measurement and subsequent categorisation within a specific organisation is a subjective measure and can vary from organisation to organisation. Therefore the three conventional (See section 2.6 in Literature review) categories proposed for this model were:

1. Low
2. Medium
3. High

Discussion for Model 1:

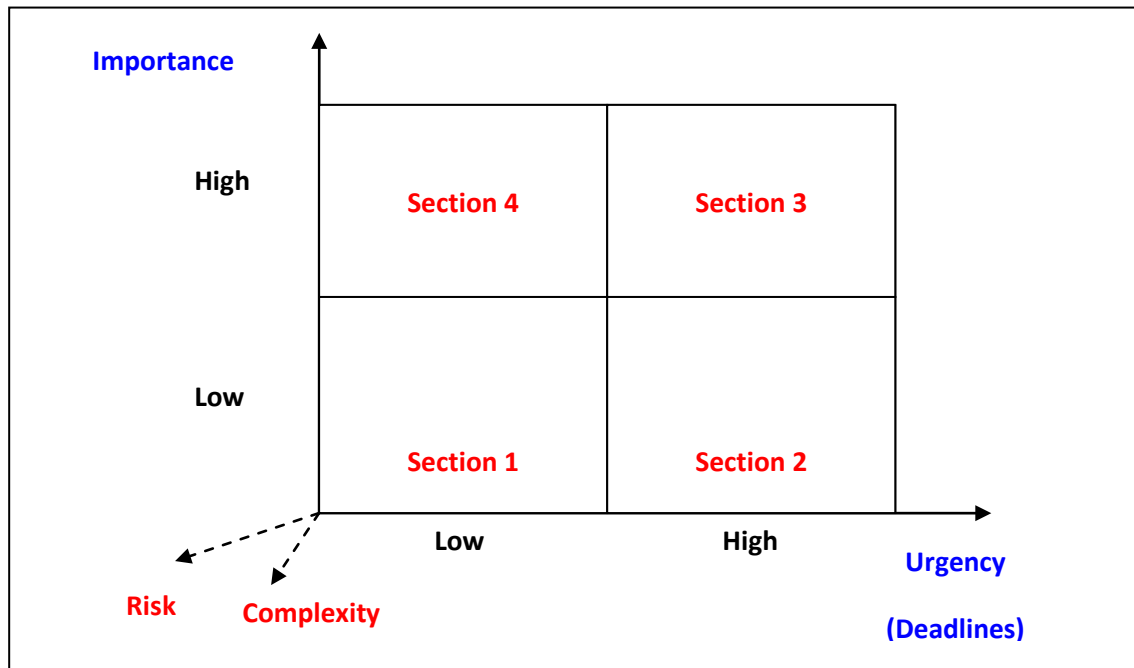
This model highlights 27 different categories (3 X 3 X 3 Matrix) of spreadsheet usage. The spreadsheet research group within UWIC discussed the above model and it was highlighted that there is some overlap within the categories of two dimensions i.e. 'Use' and 'Importance'. One of the observation was that the spreadsheets that are 'strategic' to the organisation will naturally be critically important and clearly the ones which were trivial, will be less important. Therefore the categories of the above two dimensions were simplified by removing 'strategic' and 'trivial' from the 'Use' dimension. Further to the above discussion the 'Use' dimension had two categories, i.e. Calculative and Non-Calculative. Thus a new framework for categorisation was proposed (See: Figure 5.2), with just two categories of 'Use' i.e. Calculative and Non-calculative, thereby making the model 3X3X2 matrix.

Figure 5.2: Model 1 (Modified)

5.2.2 Model 2

The Model 1 was considered to be acceptable specific to the case study department for the pilot but the classification was considered to be complex. There seems to be some overlap between 'Risk' and 'Importance' in Model 1. For example, something that represents a high risk can be assumed to be important to the organisation. Considering the complexity of the above model, another classification was proposed, for which both the dimensions and categories were kept simple and easy to understand (See: Figure 5.3). This model emphasised Importance vs. Urgency.

Figure 5.3: Model 2



Dimensions for Model 2:

- Importance could be treated in a similar manner to Model 1 as importance of the information contained within the spreadsheet (or in other words means that dealing with that spreadsheet results in a high pay-off), but in order to make it simple the number of categories were reduced to two, i.e. High and Low.
- Urgent means tight deadlines are associated with it (The urgency dimension was inspired by the presentation of Pawel J. Kalczynski (2006) at UKAIS Conference 2006 in which he talked about terminology used to define the references to time and their interpretation with respect to timescales). One of the key reasons why spreadsheets are commonly

used, as highlighted in the interviews (See Appendix 4 and later confirmed in interviews for case study 2 in Appendix 5), is that they are quick and easy to use tools. Managers in most organisations are often faced with situations where they need to make quick decisions related to resources, finances etc. These decisions can be basic/trivial (Low Importance) or strategic (High Importance). Most of the organisations can easily differentiate what is 'urgent' and what is 'not', although it might be open to interpretation based on specific job responsibilities and deadlines.

This was therefore a simple 2X2 matrix model.

Discussion:

This section now describes the individual sections of the model along with the proposed approach that can be followed for these sections.

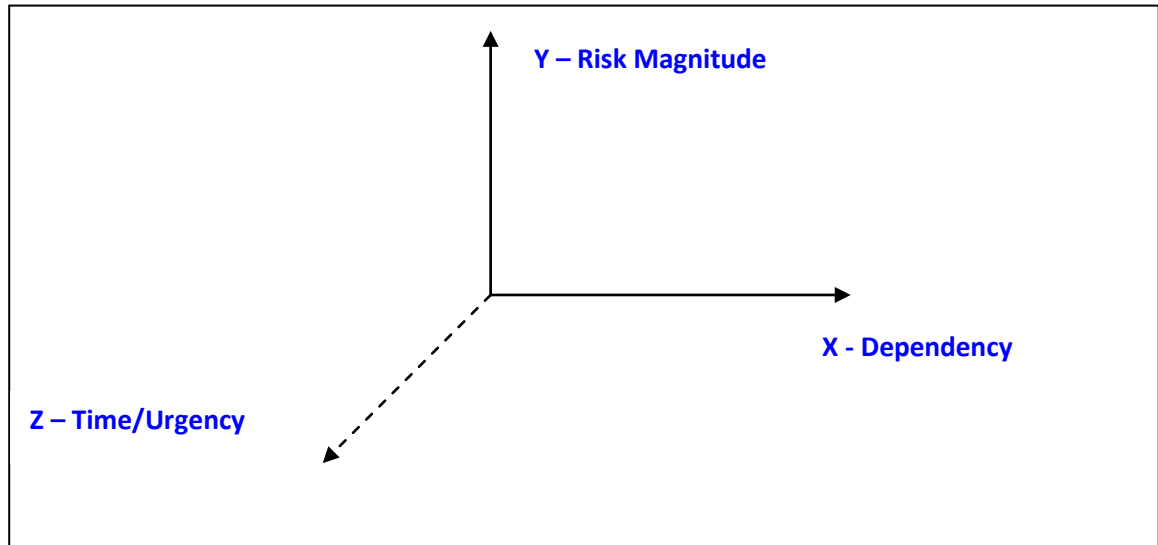
- **Section 1:** Low Importance and Low Urgency: Do nothing
- **Section 2:** Low Importance and High Urgency: This is the situation in which spreadsheets being quick and easy-to-use tools are commonly used.
- **Section 3:** High Importance and High Urgency: This is the category of spreadsheet which is critical and the organisation needs to put management controls in place.
- **Section 4:** High Importance and Low Urgency: In this category, as the urgency is low, it might be better to use other methods, like database etc.

Subsequent to further evaluation and discussion within the research group this model was considered to be very simple to implement and apply on individual basis, but there are two further dimensions, which are not fully covered within this model and need to be addressed, i.e. 'Complexity' and 'Risk', thereby making it complex and hard to implement in big organisations.

Risk in this model would have been weighted by assessing management structures and strategies in place for three main variables, spreadsheet errors, compliance and control (discussed in Literature review section 2.2 and 2.3).

5.2.3 Model 3

The overlap between the 'Use' and 'Importance' in Model 1, the fuzziness between the 'Risk' and 'Importance' in Model 1 (modified), and problems with implementing Model 2 in big and complex organisations and it being too simplistic, led the researcher to propose another model (See: Figure 5.5). This model works on more conventional approaches towards Risk.

Figure 5.4: Model 3

Dimensions for Model 3 (See: Figure 5.5):

- The Y-axis is to classify the 'Magnitude' of risk i.e. in other words the classification for this dimension can be based on severity of the consequences of errors within spreadsheets, which can be financial or business risk (which can also include reputation and compliance). The two variables that need to be calculated to measure risk is 'impact' and 'likelihood'. Means of measurement and defining specific categories has been elaborated in section 5.6 and 5.7.
- The X-axis highlights the 'Dependency', for which we can adapt the classification suggested in the literature (see Section 2.5) PWC (2004) which is Operational, Analytical/Management or Financial. The fourth classification is "Trivial", which was noticed within the case study interviews.

- The 'Urgency' dimension from Model 2 can also be incorporated into this model.

Discussion:

When defining the 'Dependency' dimension, as mentioned earlier, the classification can be Operational, Analytical/Management Information or Financial. There was another classification which was found through the case study, which is Trivial. The definitions of these classifications are given below:

1. Trivial: Used mainly as a data store, for designing forms or personal use, which are not really linked to the business organisation use as such, for example keeping daily mileage records or calculating personal monthly expenses etc.
2. Operational: Spreadsheets used to facilitate tracking and monitoring of workflow to support operational processes.
3. Analytical/Management Information: Spreadsheets used to support analytical review and management decision making. These may be used to evaluate the reasonableness of financial amounts.
4. Financial: Spreadsheets used to directly determine financial statement transaction amounts or balances that are populated into the general ledger and/or financial statements.

5.3 COMPARISON OF THE THREE MODELS:

The categorisation of the first model derived from the pilot study can be considered to be specific to this case study department. Considering the spectrum of use of spreadsheets within large organisations Model 1 seems the most appropriate. The author suggests that it might be complex to place a spreadsheet into one of the 27 categories, therefore considering the practical application Model 2 was proposed.

Model 2 is simple to apply practically but it is weaker as there are two further possible dimensions (Complexity and Risk). This might need to be considered in organisations larger than the pilot organisation. Further this model is mainly for designing/development of new spreadsheets, and it does not take into account the thousands of existing spreadsheets which might be in use within big organisations. Even as far as the case study organisation is concerned, most of the spreadsheets tend to be in Section 1 of Model 2 (Figure 5.3). Within this department the level of urgency is low, because it concerns maintaining regular records and generating feedback at the end of year.

Model 3 uses a more understandable terminology within the majority of organisations. This aspect makes it easier to understand and implement in different types of organisations. Furthermore the author believes that for the dimensions in this model it is easier to define criteria and define categories.

Figure 5.5: Summary of comparison of the Three Models.

Model 1	Model 2	Model 3
• Difficult to segregate a spreadsheet within one of the 27 categories, hence slightly complex model. • But spectrum of use of spreadsheets across the organisation covered well.	• Simple to apply practically but there are two further dimensions which might need to be considered in larger organisations • Even in the pilot organisation most of the spreadsheets fell in section 1 (i.e. Low Urgency and Low Importance) • There is fuzziness related to the spreadsheets that already exist in the organisation	▪ Conventional and more understandable in diverse organisations. ▪ Researcher thinks, the dimensions are easier to measure too. (Means to be investigated). ▪ Therefore easier to implement.

5.4 Overall inference from Case Study 1:

The spectrum of spreadsheet use within the pilot study organisation was very diverse. The research suggests that the first model proposed was simple but the key problem encountered within this model was the difficulty in classifying a specific spreadsheet within one of the 27 categories.

The Model 2 on the other hand is also simple but easier to understand. Findings suggest that this model is also easy to apply generally, but one might need to consider two further dimensions (Risk and Complexity) when considering bigger organisations. Emphasis is placed on new spreadsheet development, and there is some fuzziness in dealing with thousands of spreadsheets already existing within the organisation.

According to the analysis Model 3 seems to be the most acceptable for categorising spreadsheets. The primary reason is that it uses more conventional and universally understandable terminology and could be applied to a wide range of organisations. More specifically the dimensions are easier to understand, therefore the model is easier to implement. The author perceives that it would be easier to categorise using the Model 3 dimensions. This model will now be discussed in detail after highlighting the other observations from the case studies.

5.5 Observations from Case Study 2

This case study was carried out within the Finance Department of UWIC. All the key personnel within the department were interviewed. All the interviews, like case study 1, were transcribed and then analysed. The main purpose of this case study was to see if the categories developed as a part of the pilot study could be validated and used in another department and if the third model developed as a part of case study 1 could be used within this department as well. Besides this, the author asked general questions about use of spreadsheets, policies and approaches towards spreadsheets. This was done to verify the findings discussed in Chapter 4.

The use of spreadsheets within this department was also across the spectrum. The use ranged from designing basic forms and information databases, to

complex spreadsheets with budgeting and forecasting calculations. The use of spreadsheets could be easily classified into four themes of use that were generated from case study 1, i.e. Operational, Analytical/Management Information, Financial and Trivial (See Appendix 4). The other category of themes developed within this case study was called, General Observations, which has been discussed below.

Just like case study 1 there were no signs of version control or documentation, which is in line with the observations in Chapter 4. Some of the individuals did use some control on the spreadsheets that were shared. This was mainly for more strategic spreadsheets. The respondents said that they would possibly be more careful when working on spreadsheets with bigger amounts. When one of the respondents was asked if he had any errors that he noticed recently within his spreadsheet he casually gave one example, where he did not spot a small error. His response to this was, *“had it been £20k I would have noticed it. As it was only £1400 I didn’t”*.

The only testing used within the department was to check the bottom line figures with the Management Information System called Agresso. Besides this the only form of testing used was that if the figures were close to the guesstimated figures then it was fine. One interesting thing when asked about errors in spreadsheets was, *“I have had incidences where the figures have been slightly wrong until you check that. It’s the **gut feeling** that its wrong.”*

The reliance on spreadsheets was high and the main reasons given for the use were the ease of use and the fact that it is quicker to put data into a spreadsheet and do some calculations to get information to support decisions rather than any other means. As said by one of the respondents, *“We are making massive decisions on spreadsheets so they play a big role”*.

It was observed that the department had a Risk Register, which listed the possible risks within the department and they were given a scale based on “likelihood” and “impact”, which is similar to the process discussed in the literature review. Then based on the overall score there were strategies for mitigating these risks. This approach was similar to the approach discussed in section 2.6.3 in the literature review. The ‘impact’ variable within this model could be related to the financial values evaluated within the spreadsheet model or based on estimating the monetary value of the business risk if the model is erroneous. It was observed earlier that if the monetary values within the spreadsheet model were high, then the developers were naturally more careful. The second variable ‘likelihood’ would be related to the complexity of the model developed (This could be interpreted in light of classification of complexity provided by PWC (2004) in section 2.5 in literature review. It was highlighted in the case study interviews that, more complex the model, more likely are they to make mistakes. This approach would be useful to classify the Risk dimension in Model 3 (from now onwards referred to as the “Final Model”). This model will be discussed after the discussion of case study 2.

It was surprising to see that despite the amount of data that was stored within spreadsheets they did not feature on the Risk Register. When the respondents were asked during the interviews if spreadsheets should feature on the register, the idea was strongly supported. One respondent even said that he would not have thought about spreadsheets being on the register until he was interviewed. This clearly supports the initial observations and rationale of this thesis that there is general lack of awareness of risks associated with spreadsheets and when people are made aware of it then they support that firstly they are risky and secondly there should be an approach to mitigate risks associated with it.

When asked if the respondent thought spreadsheets are risky, he said, *"I hadn't thought about that ever. I always thought that you know that it was safe rather than doing manually I thought you know, you can put it on spreadsheet you were pretty safe than."*

...we should formalise the approach we currently take to it (Spreadsheets). And ensure that... the informal checks that we currently do are formalised before our 5 year strategic planning.

There was no compliance or auditing processes related to spreadsheets, although they were an integral part of the information flow within the department and important and sensitive records, such as student fees tracking, debtor information etc., were being maintained on the spreadsheets.

One observation, which was clearly highlighted by the previous case study as well, was the need of training, especially for the individuals developing high end

spreadsheets which feed into strategic decisions related to investment, grants etc. This observation is based on the fact that most of the respondents are self taught with little or no formal training on developing complex spreadsheet models. One of the respondents even said that they had made enough mistakes and learned from them. But once again this does not mean that they would have stopped making mistakes. The only check being that if the final figure was somewhere close to expected then it was fine.

I have made enough mistakes in the past to know. When you are an accountant anyway, you have always got half an eye on (the expected outcome); you don't do things, and just do the numbers by having half an eye on what you expect the outcome to be. So, you are always doing the bit of an idiot check yourself. Is it enough?)

Another interesting observation was the reliance on the Agresso for the checks. The information on many occasions was extracted from Agresso, then the information was manipulated and put into some useful form for making decisions and then on some occasions was fed back into the system. This can be dangerous, as if there is some error in the manipulation it can corrupt the corporate information system as well, which is observed in the literature review. Ray Panko's observation (Chapter 4, section 4.7.1), about spreadsheets supplementing corporate information systems in the EuSpRIG discussion forum held very true in this case study. Despite Agresso being the main information system, there was extensive use of spreadsheets in the day to day activities.

The reasons stated in favour of use of spreadsheets were in line with the previous observations, such as timeliness, flexibility, ease of use and powerful tool.

*it's the speed in which you can manipulate information,
where you can present information*

When evaluating the responses it was noticed that it was not really the urgency that prompted users to use spreadsheets. They said that even if they had more time they would prefer to use spreadsheets due to their flexibility and ease of use as compared to other programming languages. This was also in line with the comment from Ray Panko made in the previous chapter comparing spreadsheets to other Generation Programming Languages. The error rates are the same, but spreadsheets are more convenient to use.

5.6 Reconsidering the Third dimension in Model 3

The Model 3 was presented and discussed at the INFORMS 2007 conference in Seattle, where the author was invited to chair a conference session. This was attended by representatives from large number of organisations, such as UPS, Boeing, Phillips, IBM and Microsoft. There were three key observations that were made about the model. Firstly, the model was complex. The feedback from practitioners and academics present at the conference suggested that a three dimensional model would be too complicated to evaluate and implement in a wide range of organisations. It was observed that if a model is complex then the

organisations are less likely to implement the model. The second observation was made that the only dimension that would be hard to measure is 'Urgency', due to fuzziness in measuring time and deadlines. The third observation was that the interpretation of this dimension would vary person to person so can possibly cause confusion. At the same time the author was keen to keep this dimension due to the reason that spreadsheets, as highlighted in both primary and secondary data, are used extensively because they are easy to use and very quick to come up with the desired models. It was observed that when users are under pressure to make quick decisions (i.e. High Urgency) they are more likely to use spreadsheets due to the ease and quickness in modelling a solution. The "Urgency" dimension in Model 2 and then in Model 3 (as discussed in section 5.2.2 and 5.2.3 earlier) was a result of this observation. The two options left were to either get rid of the third dimension or absorb it into one of the other dimensions. Due to the importance of 'Urgency' as a dimension, it was decided to absorb it into another dimension rather than losing it.

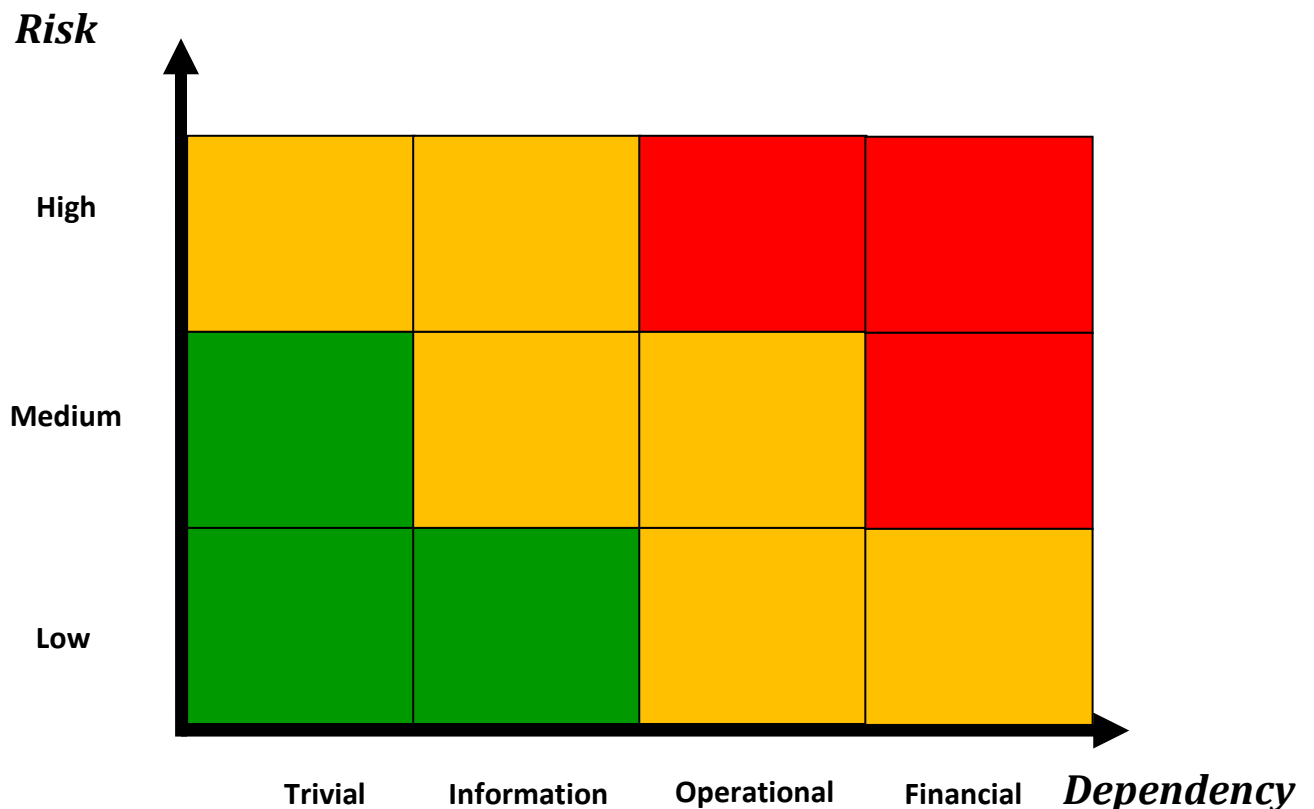
As highlighted earlier when measuring the Risk dimension there were two variables used, i.e. 'complexity' (which was related to 'likelihood') and 'monetary amount' (which was related to 'impact'). The author thought that the 'likelihood' could absorb the third dimension of 'Urgency'. If the decision-maker or the one feeding information for decision-making is operating under tight deadline (i.e. urgency is high) then the 'likelihood' of making mistakes is also high and vice-versa. Therefore the 'likelihood' would comprise of two factors, 'complexity' and 'urgency'. This helped to eventually absorb the third dimension of Model 3 called 'Urgency' into the 'Risk' dimension. This made the model two dimensional,

simpler and easier to implement. In the following section the final model will now be discussed in detail.

5.7 Final Model proposed

After completion of both case studies of the research and presenting the findings at two successive conferences, the Final Model that was proposed is provided below. See Figure 5.6)

Figure 5.6: The Final Model



The final model has two dimensions, Risk and Dependency (or Use). As clearly highlighted in the literature there is no one specific definition of risk. Therefore we use the most common interpretation of risk, which is based on 'Hazard' and 'Exposure'. The most common standard followed in the industry is measuring Risk on the basis of "Impact" and "Likelihood". This is measured as a two dimensional matrix, which can be either 3X3 or 5X5 depending on the way risk is approached in the organisation. For our model, we will consider it as a 5X5 matrix which has been shown in Figure 2.8. The same convention was also used in the Risk Register identified in case study 2. In order to measure 'likelihood' and 'impact' it was decided to use a combination of aspects.

- Complexity and Urgency (1-5 Scale): Complexity varying from information tracking Spreadsheets to ones which support complex calculations, valuations and modelling tools); along with Urgency based on the time available related to a specific decision for which that spreadsheet is being modelled. This incorporates **Likelihood**
- Value (1-5 Scale): This is estimated on basis of monetary values dealt within these spreadsheets; This incorporates the **Impact**

Multiplying the two values produces a score. As shown in the figure we can then classify the risk into three categories, i.e. High (to be given a

value of 3 in the model), Medium (to be given a value of 2 in the model) and Low (to be given a value of 1 in the model). Once a type of spreadsheet is scored on the basis of 'likelihood' and 'impact', the risk dimension could be classified as 'high', 'medium' or 'low'.

The second dimension, i.e. Dependency (or Use), is then classified into four categories; Trivial, Information/Management, Operational or Financial. The definitions of these dimensions are:

1. Trivial: Used mainly as a data store, for designing forms or personal use, which are not really linked to the business organisation use as such, for example keeping daily mileage records or calculating personal monthly expenses etc.
2. Operational: Spreadsheets used to facilitate tracking and monitoring of workflow to support operational processes.
3. Analytical/Management Information: Spreadsheets used to support analytical review and management decision making. These may be used to evaluate the reasonableness of financial amounts.
4. Financial: Spreadsheets used to directly determine financial statement transaction amounts or balances that are populated into the general ledger and/or financial statements.

Therefore the final model is now a two dimensional model with 12 categories arranged in a 3 X 4 matrix. This two dimensional matrix will then give us a

framework of categories of spreadsheet use incorporating risk with trivial low risk spreadsheets on one end and highly strategic high risk spreadsheets on the other end. One possible way would be to colour code the model (as done above) and have control structures put in place according to colour code. For example for green categories which pose low risk and are trivial use of spreadsheets, the strategy might be to do nothing. The strategy for orange categories might be to introduce some form of control structures similar to the ones highlighted in the literature related to EUC (See section 2.8). Finally the strategy for the red Category, which is likely to pose maximum problems, might either be not to use spreadsheets and use some high end programming language or develop a model with appropriate training of development methodologies and under highly controlled environment.

This framework can then be used to develop risk mitigation strategies for each category. This would then eventually:

- Improve decision making and reduce risk.
- Ensure that the motivation of spreadsheet modellers is maintained.
- Reduce the problems with compliance (e.g. Sarbanes Oxley).

The following chapter shall highlight the Conclusion and the Contribution of the thesis i.e. how the model could be possibly used and implemented within organisations.

CHAPTER SIX

CONCLUSIONS AND CONTRIBUTION OF THE THESIS

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Chapter 6: Conclusions and Contribution of the Thesis

6.1 Introduction

This doctoral thesis has investigated the extent of spreadsheet use within organisations. This was done to assess the significance of the spreadsheet errors and the risks associated with them. Once this was established the research then moved forward to identifying how to mitigate these risks and developing a model for categorising spreadsheet use incorporating risk. This chapter will look at responding to the research questions set out by addressing objectives one by one. This will then be followed by reviewing the contribution of the thesis to the body of knowledge. The chapter will then end with the ways forward highlighting the limitations of this research and how this work can be taken forward by the researchers and this researcher post PhD.

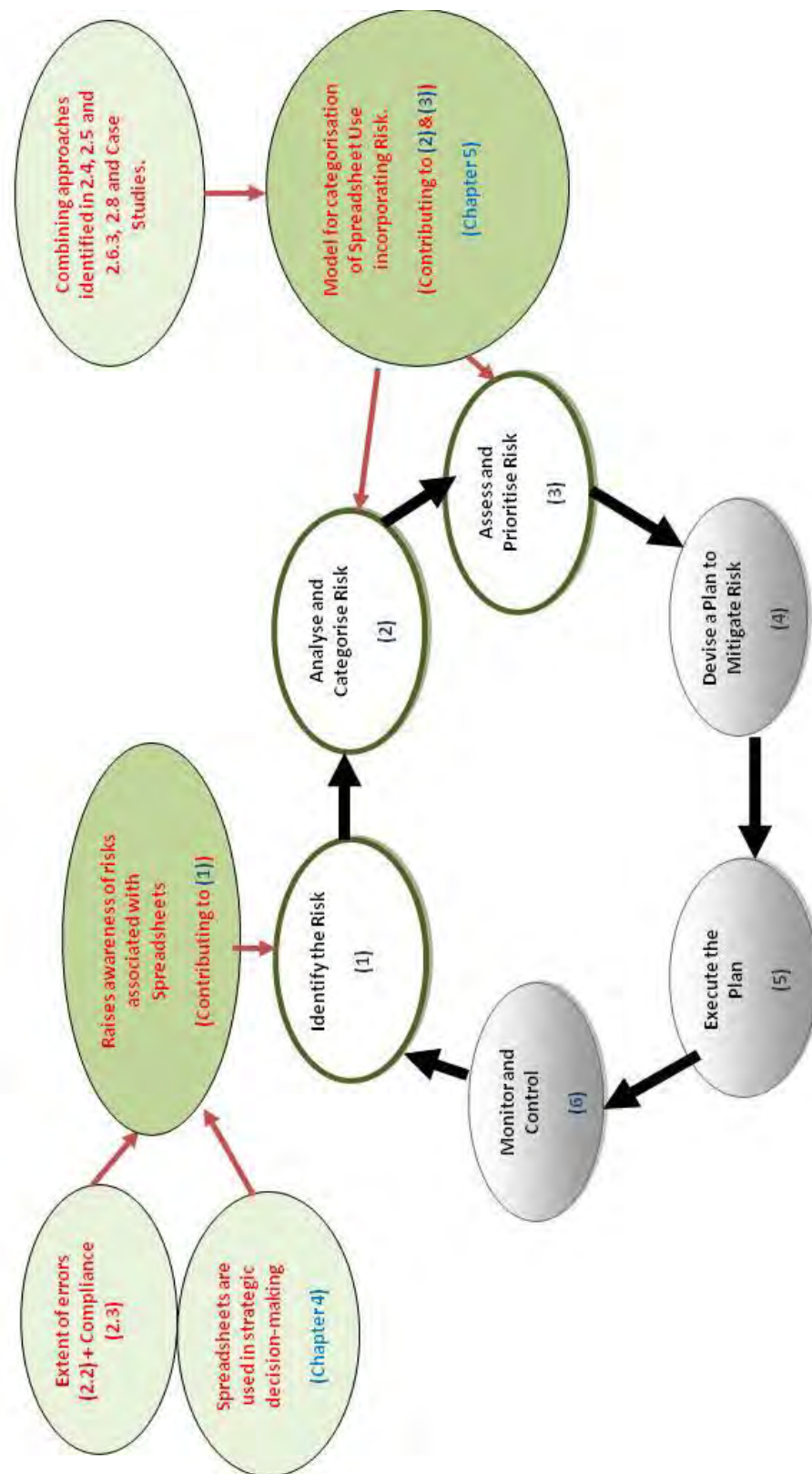
6.2 Review of Objectives

The aim of the thesis was: *“To investigate the extent of spreadsheet use within strategic decision-making enabling an assessment of the significance of spreadsheet errors and risks associated with them and finally develop a model to categorise spreadsheet use incorporating risk”*. In order to accomplish this aim, three objectives were set. These will be revisited in this section.

6.2.1 OBJECTIVE 1: *Critical review of relevant literature to develop a conceptual framework for mitigation of risks associated with spreadsheet use within strategic decision-making.*

The literature review highlighted that spreadsheets were demonstrating high levels of error rates. Spreadsheets, which at one time were just used for tracking and logging information, were now being used for complex calculative models. Compliance was highlighted as one of the key aspects where information held on spreadsheets can be questionable and so can the decisions based on them. The approach towards risks associated with spreadsheets is usually ignored as the risks are not recognised, possibly concealed or are not considered important enough. Assuming that spreadsheets are used for decision-making, when combined with the error rates, the problem is compounded. In order to find a solution to the problem, other subject areas were investigated. The author looked into subject areas, such as risk management, EUC, and IT, to find a possible solution. This contributed to the development of a conceptual framework (re-presented in Figure 6.1 for ready reference from Figure 2.13) for the mitigation of risks associated with spreadsheet use within strategic decision-making.

Figure 6.1: The Conceptual Framework



The Risk Management Cycle starts with “Identifying the risk”. It was observed that spreadsheets were not being acknowledged as potentially risky and the evidence was mostly anecdotal from the many cases where spreadsheet errors caused significant loss of money and/or contributed to damage of corporate reputation. This was the reason that the approach by organisations towards managing the risks associated with spreadsheets was not structured. This thesis has raised awareness of risks associated with spreadsheet use, which contributed to the very first step of managing risk management cycle. The scope of this study was to cover the first three nodes of the cycle highlighted in the conceptual framework.

6.2.2 Objective 2: *Investigate the level of spreadsheet use within strategic decision-making.*

The rationale of this objective was to highlight that spreadsheets are integral to organisational decision-making framework and are used extensively in all type of organisations at all levels. This was accomplished through the following means:

- A questionnaire designed in collaboration with Tuck Business School.
- Three studies done within the spreadsheet research group within UIWC.
- A study carried out by a senior member of EUSpRIG within the City of London, which was presented at a EUSpRIG Conference.

- Qualitative analysis of the online discussion through the EUSpRIG experts' forum.

It was evident that spreadsheets are here to stay. It was also evident from that spreadsheets are an integral part of organisations. Excel was the most common EUC software being used within organisations. There were some interesting observations made within this objective. Firstly, despite the fact that there was such an extensive use of spreadsheets within organisations, there was no systematic approach or control on development of them. Secondly, in general there was lack of version control, documentation and protection, etc. Thirdly, the spreadsheets developed were freely shared within and across departments and being modified by individuals to suit their requirements. Furthermore, the level of confidence that the users and developers had in their model created was high although most of the people are either self taught or have had very little training. In general the approach towards spreadsheet development and use was very casual as most people are not even aware of the risks associated with use of spreadsheets. There was no real compliance processes in place either. As reflected in the conceptual framework (see Figure 6.1) this combined with the error rates and problems associated with spreadsheets discussed in the literature and data analysis (see Chapter 4 and confirmed in Chapter 5) highlighted that spreadsheets are integral part of organisational decision making frameworks and therefore are risky for organisations.

6.2.3 Objective 3: *Investigate the use, importance and risks associated with spreadsheet within organisations and develop a model for categorising spreadsheet use incorporating risk.*

The literature in risk management prompted the approach towards risks associated with spreadsheets. This also became one of the dimensions of the final model, which will be discussed in the following section. The model was developed with the help of two case studies and the literature review. There were three possible models proposed as a result of the first case study (see chapter 5). These three models were evaluated and a final model was proposed, which was then refined with the help of the second case study. The second case study helped the author to define the dimensions and the categories (The model will be discussed in detail later in the chapter). It also helped to define the criteria for scoring and categorising risk as proposed in the literature review.

6.3 Answers to the Research Questions

Question 1: Are spreadsheets used in strategic decision-making?

The appropriate answer is an emphatic “Yes”, a response which is based on the evidence gleaned in this study through analysis of the questionnaires (Chapter 4, Section 4.3 and 4.4), supplemented by the three case studies and the study of Grenville Croll (Chapter 4, Section 4.6) and the qualitative analysis of the EUSpRIG online discussion (Chapter 4, Section 4.7), it was evident that

spreadsheets are often integral to the decision-making process in organisations. Some complex models are used in decisions related to operations, resource allocation, market research, budgeting, evaluating investment options and some of the most complex financial decisions, which are strategic to organisations. Some quotes from the respondents in above-mentioned sections within Chapter 4 highlighting this are:

I work with a Fortune 50 company who depends on spreadsheets for their very survival.

In some businesses you would also run the risk of losing the competitive edge of "timing" (first to market) if every bit of number crunching had to be developed under the auspices of the IT dept framework.

A trading desk of a large foreign bank used spreadsheets as the basis for its derivative operations.

Spreadsheets are integral to the function and operation of the global financial system.

Spreadsheets are integral to the information framework of the organisations. They are either directly used in decision-making or are used to feed information to the decision-makers. The literature highlighted the error rates. The questionnaires along with other studies for Objective 2 clearly indicated that spreadsheets are a powerful tool and it is not possible or wise to get rid of them. The focus should be more on how to channel and formalise how spreadsheets are designed and used so that their contribution is optimised and sustainable. Considering the error rates, the only option left is to control their use in some form depending on the type of use and the extent of risk associated.

Question 2: What measures can be taken to secure spreadsheet use as a decision support tool?

The spreadsheet problem is actually a business problem, rather than a technical problem. This was understood early on by the researcher. The researcher investigated how risk was approached in relation to other business problems and decided to adapt this business problem approach for spreadsheet risk. The first task was to raise the awareness associated with risks associated with spreadsheet use within organisations. As a result of investigations related to the previous research question it was evident that spreadsheets are risky. The next step therefore was to develop a risk management framework to mitigate risks associated with spreadsheet use. This study has developed a model for categorising spreadsheet use incorporating risk with risk being evaluated on the basis of 'complexity' (and 'urgency', which defined the 'likelihood' of risk) and 'value' (based on monetary values dealt within the spreadsheets, which defined 'impact' of risk). This two-dimensional model results in twelve risk categories ranging from Trivial-Low risk to Financial-High risk. This spectrum can thus be used to develop risk mitigation strategies for each category depending on the organisation that adopts the model. This is a classical approach towards risk, i.e. to identify the risk, weigh for probability and criticality and then find measures to reduce risk (and in safety critical or mission critical context reducing the risk to zero). For example, the strategy at one end of the spectrum could be 'do nothing' and the strategy at the other end could be 'implement strong control mechanisms' or possibly even 'do not use

spreadsheets'. This aspect of implementing the model and developing it further will be covered in the section on scope for further research.

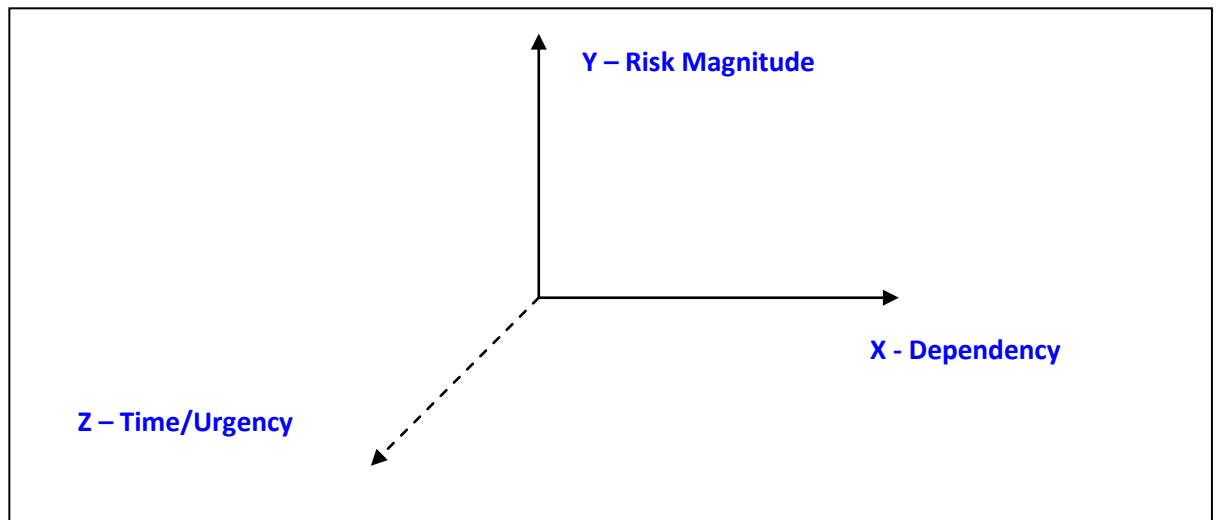
6.4 Contributions of the thesis

There are two key contributions of this thesis. The first, and key, contribution is that it helped identify through academic research that spreadsheets are an integral part of strategic decision-making, which had been mainly proven thus far through anecdotal evidence through conversations with practitioners and EUSpRIG discussions. In the process it raised awareness of risks associated with spreadsheet use. Spreadsheets should now be addressed within mainstream risk management in organisations. This puts spreadsheets onto the risk management cycle discussed in Chapter 2 (See Conceptual Framework above). Thus the first contribution was that uncontrolled spreadsheet use within organisations is or can be a 'problem'

The second contribution is working on a possible solution. This study has proposed a model for categorising spreadsheets incorporating risk. This is a three dimensional model, which was reduced to a two dimensional model, with "Risk" as one dimension and "Dependency" as the other dimension, to make it practically easy to understand and implement.

The three dimensional model proposed was:

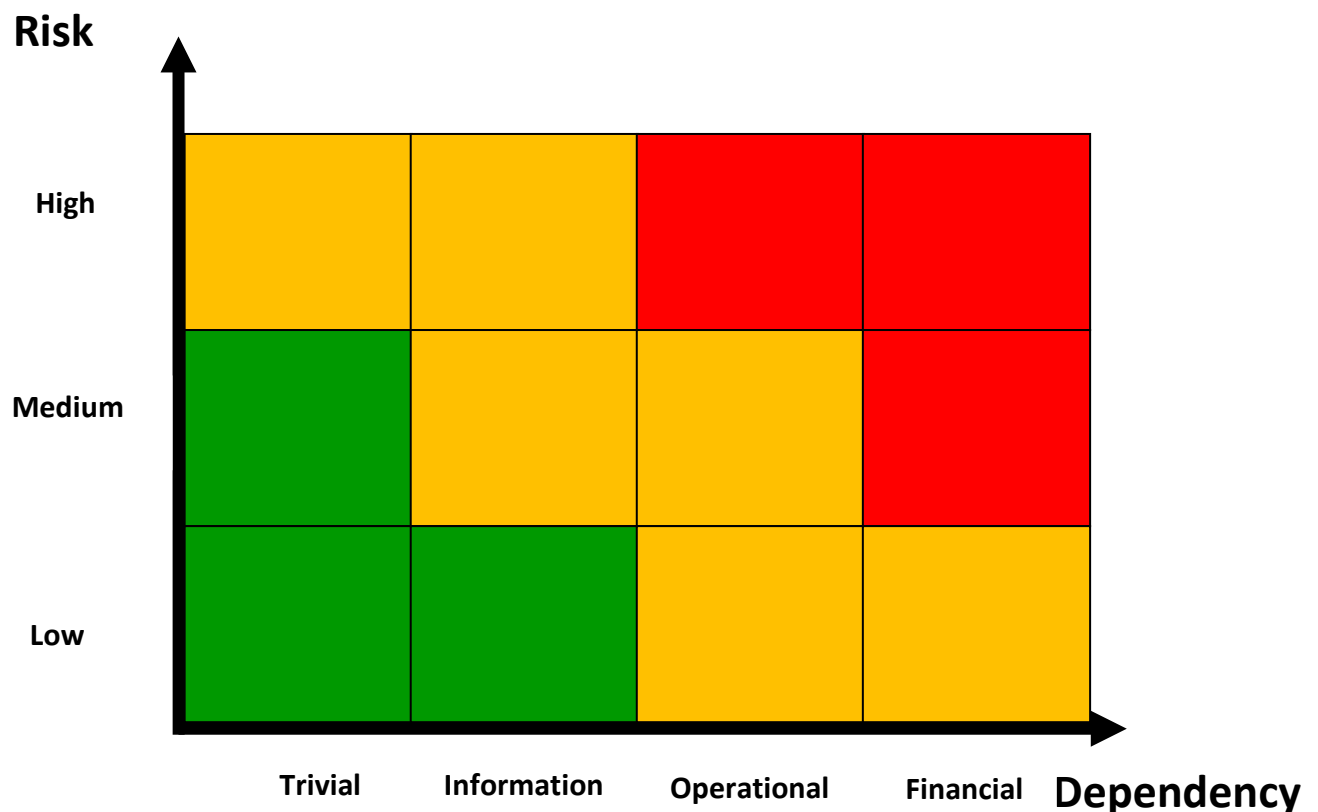
Figure 6.2: Final Model



The Y-axis is to classify the ‘magnitude’ of risk, which actually is based on the severity of the consequences of the errors within the spreadsheets, which can be financial risk, business risk, reputational risk and possibly compliance risk. The X-axis highlights the ‘dependency’, which was adapted from the categorisations suggested by PWC (2004), which was Operational, Analytical/ Management Information or Financial, with another category added after the case study called ‘Trivial’. The third dimension was based on the fact that spreadsheets are generally used because they are quick. In other words it is easy to develop a spreadsheet model than to rely on IT experts to write a specialist programme, which is one of the main reasons for the success of EUC in general. As discussed in section 5.6 of the thesis, in order to make the model

practically implementable and understandable to wider organisations, the third dimension was absorbed into the 'magnitude' (risk) dimension. The eventual model then was a two-dimensional model with 'dependency' and 'magnitude' as the two dimensions.

Figure 6.3: Two Dimensional Practical Model.



This is clearly a two-step model. The first step of the risk mitigation approach would be to use the normal scaling process to score the risk associated with spreadsheet based on 'likelihood' and 'impact'. Based on the score it could be categorised into 'low', 'medium' or 'high'. The 'impact' was clearly measured in terms of 'monetary value' within the spreadsheets or value based on business

risk including reputation of the organisation. The 'likelihood' was eventually based on two factors, i.e. 'complexity' and 'urgency'.

- Complexity 1-5 Scale (Varying from information tracking Spreadsheets to ones which support complex calculations, valuations and modelling tools) with a possibility of using PWC (2004) classification discussed in section 2.5 of Literature Review; along with Urgency based on the time available related to a specific decision for which that spreadsheet is being modelled. This incorporates **Likelihood**
- Value (1-5 Scale: Estimated on basis of monetary values dealt within these spreadsheets); This incorporates the **Impact**

Both the scales could be rated from 1 – 5 (or 1 – 3) depending on the general convention used within the organisation. Multiplying the two would then give a score from 1 to 25 (or 1 to 9). Once a spreadsheet has been scored on the basis of 'impact' and 'likelihood' the risk dimension could then be classified into three categories, 'High' (Score 3), 'Medium' (Score 2) or 'Low' (Score 1) and would form the Y-axis of the model.

The second step was to classify the 'Dependency'. The four categories for this dimension are:

1. Trivial: Used mainly as a data store, for designing forms or personal use, which are not really linked to the business organisation use as such, for example keeping daily mileage records or calculating personal monthly expenses etc.
2. Operational: Spreadsheets used to facilitate tracking and monitoring of workflow to support operational processes.
3. Analytical/Management Information: Spreadsheets used to support analytical review and management decision making. These may be used to evaluate the reasonableness of financial amounts.
4. Financial: Spreadsheets used to directly determine financial statement transaction amounts or balances that are populated into the general ledger and/or financial statements.

The model proposed is simple and is capable of being pragmatically implemented across a range of organisations. It uses common terminology, which is understandable to both technical and non-technical audience.

Once the spreadsheet requirement has been categorised using the two dimensions, it could be plotted on the model shown above. Then once we have the risk mitigation strategies for each category, this would lead to the secure use of spreadsheets as decision support tools. This framework will eventually have three-fold benefit for organisations:

- Improve decision-making and reduce risk;

- Ensure that the motivation of spreadsheet modellers is maintained;
- Reduce the problems with compliance (e.g. Sarbanes Oxley legislation).

As highlighted by IRM (2010) outputs from a successful risk management include compliance, assurance and enhanced decision-making. These outputs will then provide benefits by way of improvements in the efficiency of operations, effectiveness of tactics and the efficacy of strategy of the organisation.

As highlighted in the introduction chapter, the model developed is capable of being applied in different organisations and understandable to technical and non-technical audience. It was observed in the literature that the risk management policies are driven by top management. The results of the first research question of this study would clearly raise awareness of risks associated with the spreadsheet use. Once the management accepts that spreadsheets are risky and the risks need to be addressed they can use the model to assess and prioritise the risks associated. Once this is accomplished, i.e. after understanding the spectrum of spreadsheet use and associated risk within the organisation, the policy makers (usually the top management) within the

organisation need to decide the control structures and risk mitigation strategies for each category. The decision-makers on the other hand will then need to understand and accept these strategies.

In the current environment organisations are being closely monitored for their reporting and data storage and there is further tightening of the compliance regulations and increasing liability for the organisations. In such an environment it is not about **whether** this model, or in wider sense a systematic approach towards spreadsheet risk, will be accepted by organisations or not, but it is about **WHEN**.

6.5 Thesis Limitations

This research was self-funded and was based on limited opportunities that could be managed with the resources the researcher had access to. Being a member of the EUSpRIG community was very useful as it gave some vital contacts and also a platform for the researcher to present the key findings. The thesis does have some limitations. As mentioned earlier, the thesis was written approaching the spreadsheets risk as a 'business problem'. The approach was intentionally kept simple so that the contributions could be clearly understood and widely implementable.

As highlighted earlier (refer Chapter 1), when the idea of the thesis was presented in the UKAIS PhD Consortium, the author was suggested to restrict the scope of the study to the development of the model of categorisation of spreadsheet use, rather than developing the complete framework. Further when the questionnaire was to be developed, the author met the representatives from Tuck Business School in a EUSpRIG conference, and decided to do a joint questionnaire. The respondents of the questionnaires were mainly Tuck Alumni and were mainly MBA graduates. Thus there was a restriction on the educational background of the respondents.

There were limitations related to Objective 3 as well for selecting the case studies. The author tried to approach external organisations and was refused as the organisations were not aware of the potential risks spreadsheets could pose to the organisations and were not interested in the research. One organisation that agreed to give access initially was HMCE (Her Majesty's Customs and Excise) but that access did not materialise due to the merger of HMCE and Inland Revenue (IR) taking place at the same time, leading to formation of HMRC (Her Majesty's Revenue and Customs). Thus the case studies chosen were from UWIC. The case studies were intentionally not within the department that the author worked. This was done in order to reduce possible bias.

Another limitation was the availability of literature specific to spreadsheet risk management. This limitation rather than de-motivating, gave the author more confidence that that research was novel.

6.6 Opportunities for further research

Through this research the author has advanced the body of knowledge within the area of spreadsheet risk management by raising awareness of the risks associated with its use and approach towards mitigating them. As highlighted in the limitations the scope of the thesis had to be restricted to the development of the model. This is a developmental research and does not end with the model developed. This model needs to be implemented and refined further in other organisations. There are many steps further that need to be taken in order to complete the risk management cycle for spreadsheet use. This thesis just contributes to the first two stages, i.e. 'Identify the risk' and 'Analyse and categorise risk' and partly to the third stage 'Assess and Prioritise risk'. There are further steps in the risk management cycle (as highlighted in the conceptual framework) that need to be addressed. The author intends to take this research further and achieve this post doctoral. Other approaches such as Appreciative Enquiry or Action Research could yield further contributions to the body of knowledge. Some of the possible approaches proposed in the EUSpRIG forum that could, after due research, be considered are the ones by Lemon and Ferguson (2010); Balson (2010); McGeady and McGouran (2008). The other option is that, once the categorisation of the spreadsheet risk is done then one

of the standard approaches to risk management proposed by Institute of Risk Management (2010) in ISO 3001 could be possibly followed.

The moment that the risk management model is implemented and strategies are developed, this would open a door of research into human and psychological factors. It is evident that social, psychological and change theory are an integral part of the implementation process. Further research into this aspect could contribute to implementation and gaining access to organisations. The aspects of human psychology, change theory, Hilgar and Atkinson's Theory of Dissociation, Denial theory and many more will be unfolded within this research.

Once this is done, then further research could be used to develop specific strategies for mitigating risks for each category. This would then complete the risk management framework for spreadsheet use within organisation and thereby help policy developers to develop appropriate policies.

Another avenue of scope for further research is already underway within UWIC. A joint effort between Finance and Accounting and Information Systems and Computing department at UWIC saw the validation of a new MSc in Finance and Information management in 2009. This programme is aimed at *"the next generation of financial decision makers who need an appreciation of both*

finance and information management” Thorne (2010, p124). Simon Thorne (2010) in his paper titled, “*Defending the future: An MSc module in End User Computing Risk Management*”, presented in EUSpRIG Conference. He talks about setting up an M – level module in EUC Risk Management. This paper referred to the model proposed in this thesis as a one that can be used to identify critical and risky spreadsheets by providing an effective metric or means to measure spreadsheet risk.

As highlighted in the findings of this thesis it is not about getting rid of spreadsheets and reducing the scope of EUC. It is to use them a little more sensibly and carefully with a full understanding of the risks involved as one would do with any other powerful tool.

Bibliography

-
- ACTIA (Australian Capital Territory Insurance Authority), (2004), *Guide to Risk Management: Insurance and Risk Management Strategies*, Published February 2004. Source: Business Source Premier.
 - Adams, J. (2004), *Risk*, Routledge, London, Fourth Edition.
 - Alavi, M. and Weiss, I. R. (1986), Managing the Risks Associated with End-User Computing, *Journal of Management Information Systems*, 2(3).
 - Alavi, M. Nelson, R. and Weiss I. (1987), *The Management of End-User Computing: Critical Attributes for Organizational Success*, Proceedings of the Twentieth Hawaii International Conference on Systems Sciences, Kona, Hawaii, January 6-9, 1987.
 - Alavi, M., Nelson, R. R. and Weiss, I. R. (1988), Strategies for End User Computing: An Integrative Framework, *Journal of Management Information Systems*, 4(3).
 - Alter, S. (1999), 'Information Systems: A Management Perspective', Harlow, Reading, Edition.
 - Batchelor, C. (2010), *A Tool That is Too Ad Hoc and Open to Error*, Connected Business Supplement to Financial Times, December 2010.
 - Baxter, R. (2005), 'Regulation and Integrity of Spreadsheets in the Information Supply Chain', EUSPRIG 2005 Conference, University Of Greenwich, July 7-8 2005, Conference Proceedings.
 - Bellinger, A. (2005), Tackling the Hidden Costs of Spreadsheets, IT Training, July 2005, Available from: Business Source Premier; [://search.epnet.com/login.aspx?direct=true&db=buh&an=](http://search.epnet.com/login.aspx?direct=true&db=buh&an=)

-
- Bernstein, P. L. (1998), *Against The Gods: The Remarkable Story of Risk*, John Wiley and Sons, Inc, USA
 - Beuhler, K. Freeman, A. and Hulme, R. (2008), *The Risk Revolution, The Strategy: Owning the Right Risks*, Harvard Business Review, September 2008.
 - Beuhler, K. Freeman, A. and Hulme, R. (2008b), *The New Arsenal of Risk Management*, Harvard Business Review, September 2008.
 - Blaxter, L., Hughes, C. and Tight, M. (1996), *How to Research*, Open University Press, Buckingham.
 - Bostrom, R. P. and Brown, C. V. (1989), 'Effective Management of End-user Computing: A Total Organisation Perspective', Journal of Management Information Systems, Fall, Vol. 6, No. 2.
 - Britannica Online Encyclopedia (2010), *Definition of Spreadsheets and Management Information Systems*, Available online on: [://www.britannica.com/](http://www.britannica.com/) (Accessed on November 2010)
 - Burns, R. R. (2000), *Introduction to Research Methods*, Edition, Sage, London.
 - Butler, R., 2000, '*Is this Spreadsheet a tax evader? How Customs and Excise tax test spreadsheet applications*', Proceedings of Hawaii International Conference on systems science, Pages 4 – 7.
 - Canning, R. G. (1983), Future effects of end user computing, EDP Analyser, 21, November, pp 1-12.
 - Cardiff County Council, (2004), *Risk Management: An Implementation Guide*, Authored by Julian Cummings, Issue 1.

-
- Chadwick, D. (2002), Stop the Subversive Spreadsheet!, Presented at EUSpRIG 2002 Conference, University of Wales Institute Cardiff, Cardiff, UK. July 18-19, Conference Proceedings, Downloaded from: [:/www.gre.ac.uk/~cd02/eusprig/](http://www.gre.ac.uk/~cd02/eusprig/) Accessed on June, 2006
 - Chang, P. L. and Shen, P. D. (1997), A Conceptual Framework for Managing End User Computing by the Total Quality Management Strategy, Total Quality Management, 8(1).
 - Charette, R. N. (1989), *Software Engineering Risk Analysis and Management*, McGraw Hill Inc., US.
 - Charmaz, K. (2006), *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*, Sage, London.
 - Chartered Institute of Bankers (1998), *The Banks and Risk Management*, Based on the seminar held at Christ's College, Cambridge, 4-9 September 1998, Chartered Institute of Bankers, London.
 - Chicken ,C & Posner,T (1998) *The Philosophy of Risk*, London, Thomas Telford.
 - Cleary, P. Norris, L. J. and Madahar, M. (2005), *Spreadsheet Risk and Corporate Responsibility – are UK/EU Directors Liable?*, EUSpRIG 2005 Conference, University of Greenwich, London, UK 7-8 July, Conference Proceedings.
 - Cleary, P. Norris-Jones, L. and Madahar, M. (2005), *Spreadsheet Risks and Corporate Responsibility – Are UK/EU Directors Liable?*, EUSpRIG Conference at University of Greenwich, London, 7- July.

-
- Colver, D. (2007), *Inclusion Analysis: Finding Omission Errors*, EUSpRIG 2007 Conference, University of Greenwich, London, UK, July 11-13, Conference Proceedings.
 - Community Banker (2007), *Financial Institutions Spending More on Information Technology*, December Issue, p63.
 - Computer World (2008), *Excel error leaves Barclays too much Lehman*, October, 2008: Available online on: [://www.computerworld.com/s/article/9117143/Excel error leaves Barclays with more Lehman assets than it bargained](http://www.computerworld.com/s/article/9117143/Excel_error_leaves_Barclays_with_more_Lehman_assets_than_it_bargained), Accessed on October, 2008
 - Croll, G. (2009), *Spreadsheets and the Financial Collapse*, EUSpRIG 2009 Conference, ENS Cachan, Paris, France, July 2-3. Conference Proceedings.
 - Croll, G. J. (2005), *The Importance and Criticality of Spreadsheets in the City of London*, Proceedings of the sixth International EuSpRIG Conference, University of Greenwich, London, July 7-8.
 - Croll, H. J. (2009), *Spreadsheets and the Financial Collapse*, EUSpRIG Conference Proceedings, ENS Cachan, Paris, 2-3 July.
 - Curtis, G. (1998), *Business Information Systems: Analysis, Design and Practice*, Harlow, Addison Wesley Longman, Third Edition.
 - Davis, G. B. (1982), *Caution, User-developed Decision Support Systems can be Dangerous to Your Organisation*, Proceedings of Fifteenth Hawaii International Conference on System Sciences, Honolulu, Hawaii, 6-8 January. Source: EBSCO.

-
- Davis, G. B. (1987), Information Systems, Accounting Horizons, June 1987, Vol 1, Issue 2. Available Online from: Business Source Premier.
 - Dawson, C. (2002), *Practical Research Methods: A User-friendly Guide to mastering Research Techniques and Projects*, Parkwest Publications, Oxford.
 - Denscombe, M. (1998), *The Good research Guide*, Open University Press, Buckingham.
 - Denscombe, M. (2008), *Communities of Practice*, Journal of Mixed Methods Research, Vol. 2, No. 3, 270 – 283, Sage Publications
 - Dickson, G. C. A. (2003), *Risk Analysis*, Witherby and Co. Ltd, London, Edition.
 - Ditlea, S. (1987). *Spreadsheets Can be Hazardous to Your Health*. Personal Computing, 60-69.
 - Doyle, L., Brady, A. M. and Byrne, G. (2009), *An Overview of Mixed Methods Research*, Journal of Research in Nursing, Vol.14, No. 2, March 2009.
 - Easterby-Smith, M., Thorpe, R. and Lowe, A. (2002), *Management Research: An Introduction*, Edition, Sage, London
 - Ernst and Young (2008), *How do I Assess Risk: Special Report on Risk Management*, [.directorship.](#), February/March 2008. Source: Business Source Premier.
 - EUSpRIG (2010), [://www.eusprig.org/horror-stories.](http://www.eusprig.org/horror-stories), Accessed on 19th December 2010)

-
- Fernandez, K. (2003), '*Investigation and Management of End User Computing Risk*', April 2003, Unpublished MSc Dissertation, available from University of Wales Institute Cardiff (UWIC) Business School.
 - FINRA (2010), FINRA Examination Priorities letter, 1 March 2010, [://www.finra.org/web/groups/industry/@ip/@reg/@guide/documents/industry/p121004](http://www.finra.org/web/groups/industry/@ip/@reg/@guide/documents/industry/p121004).
 - Freeman, D. (1996). *How to Make Spreadsheets Error-Proof*. Journal of Accountancy, 181(5), 75-77.
 - Galletta, D. F. and Hufnagel, E. M. (1992) A model of end user computing policy, Information and Management, 22, pp 1-18.
 - Gerrity, T. P. and Rockart, J. F. (1986), 'End-user Computing: Are you a Leader or a Laggard?', Sloan Management Review, Summer 1986.
 - Gibbons, M. L., Limoges, H., Nowotny, S. Schwartzman, P., Scott, P. and Trow, M. (1994), *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, Sage, London.
 - Gill, J. & Johnson, P. (1997), *Research Methods for Managers*, Paul Chapman Publishing Ltd., Great Britain
 - Glaser, B. and Strauss, A. (1967), *The Discovery of Grounded Theory*, Aldine, Chicago, US.
 - Gosling, C. (2003), '*To What Extent are System Design and Development Techniques Used in the Production of Non-Clinical Corporate Spreadsheets at a Large NHS Trust*', May 2003, Unpublished MBA dissertation, available from University of Wales Institute Cardiff (UWIC) Business School.

-
- Hammond, D. Clark, T. Hartman, S. and Crow, S. (1995), 'One More Time: Does a Computer Based Decision Support System Improve Managerial Decisions?', *International Journal of Computer Applications in Technology*, 1995, 8(5/6), pp. 290-300.
 - Handy, C. B. (1995), *The Empty Raincoat*, Random House Business Books, London.
 - Henderson, J. C. and Treacy, M. E. (1986), 'Managing End-user Computing for Competitive Advantage', *Sloan Management Review*, 27, 2 (June 1986).
 - Hertz, D. & Thomas, H. (1984) *Practical Risk Analysis*, New York, John Wiley & Sons
 - Hodgkinson, G. P., Herriot, P. and Anderson, N. (2001), *Re-aligning the Stakeholders in Management Research: Lessons from Industrial, Work and Organisational psychology*, *British Journal of Management* 12, Special Issue.
 - Hormann, F. (1999), 'Getting the OOPS! Out of Spreadsheets', Downloaded from: [://www.aicpa.org/pubs/jofa/oct1999/hormann](http://www.aicpa.org/pubs/jofa/oct1999/hormann). Accessed on 21st October 2005
 - ICAEW (Institute of Chartered Accountants in England and Wales), (2002), *Risk Management for SMEs*, Published by Faculty of Finance and Management, London in October 2002. Source: Business Source Premier.

-
- IOMA (2004), Institute of Management & Administration Report on Managing Credit, Receivables & Collections, Issue 04-12, December, 2004. Available from [.ioma.](#)
 - IOSH (Institution of Occupational Safety and Health) (2002), *SME Risk Management*, Risk Management Booklet. Source: Business Source Premier.
 - IRM (2010), *A Structured Approach to Enterprise Risk Management (ERM) and the requirements of ISO31000*, Document published by Institute of Risk Management, Available online: [://www.theirm.org/ISO31000guide.](http://www.theirm.org/ISO31000guide)
 - IRM, AIRMIC and ALARM (2002), *The Risk Management Standard*, Published jointly by IRM, AIRMIC and Alarm (Available through Business Source Premier).
 - Janes, P. (2005), *'An Investigation of the Risks Associated with Spreadsheet Use within UWIC'*, August 2005, Unpublished MSc Dissertation, available from University of Wales Institute Cardiff (UWIC) Business School.
 - Jordan, E. (2005), *An Integrated IT Risk Model*, Pacific Asia Conference on Information Systems (PACIS) 2005 Conference Proceedings. Source Academy of Information Systems (AIS), [://aisel.aisnet.org/pacis2005/](http://aisel.aisnet.org/pacis2005/).
 - Kollar, J. J. (2007), Conduct a thorough risk assessment, Business Insurance, Vol. 41, Issue 36, p28-29.
 - Lemon, T. and Ferguson, E. (2010), *A Practical Approach to Managing Spreadsheet Risk in a Global Business*, EUSpRIG 2010 Conference,

University of Greenwich, London, UK July 15-16, Conference Proceedings.

- Loghry, J. D. and Veach, C. B. (2009), *Risk Management: Enterprise Risk Assessments*, Professional Safety, February, 2009. Source: Business Source Premier.
- London Travel Watch, (2009), *Risk Management Policy*, Policy of London Travel Watch towards management of risk. Source: Business Source Premier.
- Meade, A. (2010), cited in the article by Charles Batchelor, *A Tool That is Too Ad Hoc and Open to Error*, Connected Business Supplement to Financial Times, December 2010.
- Merna, T. and Al-Thani, F. F. (2008), *Corporate Risk Management*, John Wiley and Sons, Ltd. Second Edition, London.
- Morgan, D. L. (2007), *Paradigms Lost and Pragmatism Regained*, Journal of Mixed Methods Research, Vol. 1, No. 1, 48 – 76, Sage Publications
- Munro, M. C., Huff, S. L. and Moore, G. (1988), *Expansion and Control of End User Computing*, Journal of Management Information Systems, Vol. 4, No. 3. Source: EBSCO.
- Muzzy, L. (2008), *Approaching Enterprise Risk Management*, Financial Executive International, October 2008. Source: Business Source Premier.

-
- Northern Ireland Government (2005), *A Guide to Risk Assessment in Northern Ireland*, Ver. 4. October 2005, Guide for public service organisations in Northern Ireland. Source: Business Source Premier.
 - Oxford Dictionary (2010), *Definition of Spreadsheets and Management Information Systems*, Available online on: [://oxforddictionaries.com/?attempted=](http://oxforddictionaries.com/?attempted=) (Accessed on November 2010)
 - Paladino, B. (2008), *Strategically Managing Risk in Today's Perilous Markets*, Strategic Finance, November 2008.
 - Panko R. R. and Halverson, R. H. (1996), *Spreadsheets on Trial: A Framework for Research on Spreadsheet Risks*, *Proceedings of the Twenty-Ninth Hawaii International Conference on System Sciences*, Vol. II, Kihei, Hawaii, Los Alamitos, January. IEEE Computer Society
 - Panko, R. R. (1997). Spreadsheet Research (SSR) Website ([://www.cba.hawaii.edu/panko/ssr/](http://www.cba.hawaii.edu/panko/ssr/)). Honolulu, Hawaii: University of Hawaii. Accessed on October 2004
 - Panko, R. R. (2003), *Reducing Overconfidence in Spreadsheet Development*, EUSpRIG 2003 Conference, Trinity College, Dublin, Ireland, July 24-24. Conference Proceedings.
 - Panko, R. R. and Ordway, N. (2005), *Sarbanes Oxley: What About All the Spreadsheets?*, EUSPRIG 2005 Conference, University Of Greenwich, London, UK, July 7-8 2005, Conference Proceedings.
 - Pemberton, J. D. and Robson, A. J. (2000), *Spreadsheets in Business, Industrial Management and Data Systems*, 100/8, MCB University Press.

-
- Pressman, R. S. (2000), *Software engineering : a practitioner's approach*, McGraw Hill, London.
 - Purser, M. and Chadwick, D. (2006), *Does Awareness of Differing Types of Spreadsheet Errors Aid End-users in Identifying Spreadsheet Errors?*, EUSpRIG 2006 Conference, Fitzwilliam College, Cambridge, UK, July 5-7, Conference Proceedings.
 - PWC (2004), *The Use of Spreadsheets: Considerations for Section 404 of the Sarbanes-Oxley Act*, Whitepaper published in July 2004. Available from: [://www.pwcglobal.com/extweb/service.nsf/docid/](http://www.pwcglobal.com/extweb/service.nsf/docid/)
 - Rajalingham, K. (2005), *A Revised Classification of Spreadsheet Errors*, EUSPRIG 2005 Conference, University Of Greenwich, London, UK, July 7-8, Conference Proceedings.
 - Rajalingham, K. Chadwick, D. and Knight, B. (2000), *Classification of Spreadsheet Errors*, EUSpRIG 2000 Conference, University of Greenwich, London, UK, July 17-18, Conference Proceedings.
 - Randles, C. (2005), *Spreadsheets just aren't for Engineering*, Product Design and Development, October 2005, Volume 60, Issue 10. Available from: [://search.epnet.com/login.aspx?direct=true&db=buh&an=Business Source Premier](http://search.epnet.com/login.aspx?direct=true&db=buh&an=Business Source Premier);
 - Rayner, N. (2010), *Financial Heads Need Much Wider View of IT*, Connected Business Supplement to Financial Times, December 2010.

-
- Remenyi, D., Williams, B., Money, A. and Swartz, E. (1998) *Doing Research in Business and Management: An Introduction to Process and Method*, Sage, London.
 - Riabokon, V. (2004), *Risk*, Available from: [://www.energy-markets.com/reports/RISKColumn](http://www.energy-markets.com/reports/RISKColumn).
 - Robson, C. (2002), *Real World Research*, Edition, Blackwell, Oxford.
 - Saunders, M., Lewis, P. and Thornhill, A., (2007). *Research Methods for Business Students*, (Edition). Harrow, Prentice Hall.
 - Smith, N. J. (ed) (1999), *Managing Risk in Construction Projects*. Oxford, Blackwell Science
 - Stoneburner, G. Goguen, A. and Feringa, A. (2002), *Risk Management Guide for Information Technology Systems*, National Institute of Standards and Technology, US Department of Commerce, Special Publication 800-30.
 - Suffolk County Council, (2007), *A Practical Guide to Risk and Opportunity Management in Suffolk County Council*, Ver. 3 March 2007. Source: Business Source Premier.
 - Systems Modelling Ltd. (2003), *Agile Approaches to Spreadsheet Development*, Available Online from: [://www.sysmod.com/spreads](http://www.sysmod.com/spreads).
 - Teo, T. S. H. and Tan, M. (1997), *Quantitative and Qualitative errors in Spreadsheet Development*, Proceedings of the Thirtieth Hawaii International Conference on System Sciences, Maui, Hawaii, January – . IEEE Computer Society

-
- Thorne, S. (2009), *A Review of Spreadsheet Error Reduction Techniques*, Communications of the Association of Information Systems, Vol. 25, Article 34. Available from [://aisel.aisnet.org/cais/vol25/iss1/34/](http://aisel.aisnet.org/cais/vol25/iss1/34/)
 - US Department of Energy, (2008), *Risk Management Guide*, Washington D.C. USA. Available at [.directives.doe.](http://directives.doe.gov). Source Business Source Premier.
 - Vowler, J. (2002), Are your Spreadsheets Running Wild?, Computer Weekly, 15 August 2002.
 - Walker, P. L. and Shenkir, W. G. (2008), *Implementing Enterprise Risk Management: Checklist*, Journal of Accountancy, March 2008. Source: Business Source Premier.
 - Ward M (1997, August 16). *Fatal Addition*, New Scientist.
 - Wharton, F. (1992), *Risk: Analysis, Assessment, and Management*, John Wiley and Sons, Chichester.
 - White, C. (2004), *Strategic Management*, Palgrave Macmillan, New York.
 - Yin, R. K. (2003), *Case Study Research: Design and Method*, Edition, Sage, London.
 - Yin, R. K. (2009), *Case Study Research: Design and Methods*, Edition, Sage, London.
 - Zikmund, W. G. (2000), *Business Research Methods*, Edition, Dryden Press, Texas, US.

Appendix 1

Questionnaire

SURVEY ON SPREADSHEET USAGE

Spreadsheet Usage

1. Please check the types of software you use in your job.
 - a. Microsoft Excel
 - b. Quattro Pro
 - b. Lotus 1-2-3
 - c. Microsoft Access
 - d. Visual Basic for Applications (VBA)
 - e. Oracle database
 - f. IBM database
 - g. Other
2. Level of importance spreadsheets have in your job.
 - a. Unimportant
 - b. Moderately important
 - c. Very important
 - d. Critical
3. Please classify your experience with spreadsheets.
 - a. Little or no experience
 - b. Some experience; still a beginner
 - c. Extensive experience; some expertise
 - d. Very experienced; high expertise.
4. Type(s) of training have you had using spreadsheets.
 - a. None
 - b. Formal classroom instruction
 - c. Occasional informal training sessions
 - d. Books and manuals
 - e. Demonstrations from colleagues
5. When working with spreadsheets, you typically work:
 - a. By yourself
 - b. In a team of 2 or 3
 - c. In a larger team (4 or more)
6. Approximate percent of time spent with spreadsheets in your job.
 - a. 0-25%
 - b. 26-50%
 - c. 51-75%
 - d. 76-100%
7. Main purposes of spreadsheets you use .
 - a. Maintaining lists (e.g. names and addresses)
 - b. Tracking data (e.g. budgets, sales, inventories)
 - c. Analyzing data (e.g. financial, operational)
 - d. Determining trends and making projections
 - e. Evaluating alternatives
 - f. Other
8. Techniques used in your spreadsheets.
 - a. Statistical analysis
 - b. Optimization (e.g. Solver, *What's Best*)
 - c. Simulation (e.g. *Crystal Ball*, *@Risk*)
 - d. None of the above

9. How often each of the following specific spreadsheets tools are used:

		Never	Rarely	Occasionally	Frequently	Every Day
a.	Goal Seek Tool					
b.	LOOKUP Functions					
c.	Pivot Tables					
d.	Conditional formatting					
e.	IF Function					
f.	Formula Auditing Tools					
g.	Chart Wizard					
h.	Function Wizard					
i.	Solver					
j.	Financial Functions (e.g. NPV, IRR, PMT)					
k.	Find/Replace					
l.	Macros					
m.	Data Table Tool					
n.	Data Sort Tool					

10. Number of different spreadsheets you normally use per week.

- a. 0-1
- b. 2-5
- c. 6-10
- d. more than 10

11. Those who report to you use spreadsheets to develop recommendations for you.

- a. Yes
- b. No
- c. Not applicable
- d. Don't know

12. *Creator* of spreadsheets in your work.

- a. Yes
- b. No (if 'no' go to questions 22)

Spreadsheet Creation

13. Create spreadsheets *from scratch*
 - a. Always
 - b. Sometimes
 - c. Never
14. Percentage of work time devoted to spreadsheet *creation*.
 - a. 1-10%
 - b. 11-20%
 - c. 21-30%
 - d. 31-40%
 - e. 41-50%
 - f. > 50%
 - g. Other
15. Division of spreadsheet models into separate, integrated modules, either on a single sheet or by using multiple sheets.
 - a. Never
 - b. Sometimes
 - c. Usually
 - d. Always
16. Size of models normally created.
 - a. under 100 cells
 - b. 101 to 1000 cells
 - c. 1001 to 10,000 cells
 - d. 10,001 to 100,000 cells
 - e. over 100,000 cells
17. How often you separate all data inputs from the formulas in your spreadsheet.
 - a. Never
 - b. Sometimes
 - c. Usually
 - d. Always
18. Typical first step in creating a spreadsheet.
 - a. Borrow a design from another spreadsheet
 - b. Sketch the spreadsheet on paper
 - c. Write the fundamental relationships using algebra
 - d. Enter the data and formulas directly into a computer
 - e. Other
19. Frequency of usage of systems development methodologies (e.g. SDLC, RAD)
 - a. Always
 - b. Sometimes
 - c. Never
20. Best description of your work in creating spreadsheets.
 - a. Work independently
 - b. Seek advice from another person(s)
 - c. Work with a peer group
 - d. Work with a project team

21. Other people normally use the spreadsheets you create.
- a. No, my spreadsheets are for my personal use.
 - b. My spreadsheets are shared with one or two others
 - c. My spreadsheets are used by a number of people.
 - d. My spreadsheets often become permanent assets in my organization.

Spreadsheet Testing

22. Testing of spreadsheet models that you or others create.
- a. Never, (if 'never', go to questions 25)
 - b. Sometimes
 - c. Usually
 - d. Always
23. Which of the following methods used to test spreadsheets.
- a. Test extreme case
 - b. Use a calculator to check selected cells
 - c. Display all formulas
 - d. Examine formulas individually
 - e. use Go To - Special
 - f. Test performance for plausibility
 - g. Error Checking option
 - h. Formula Auditing Toolbar
 - i. Use common sense
 - j. Other tools:
24. Percentage of time (approximate) devoted to spreadsheet testing.
- a. 0%
 - b. 1-10%
 - c. 11-20%
 - d. 21-30%
 - e. 31-40%
 - f. 41-50%
 - g. > 50% and other

Spreadsheet Documentation

25. Documentation of spreadsheets (either within the spreadsheets or in a separate document)
- a. Never (If 'never', go to question 28)
 - b. Sometimes
 - c. Usually
 - d. Always
26. Techniques used to document spreadsheets.
- a. Text in spreadsheet
 - b. Cell Comments
 - c. Documentation sheet in workbook
 - d. Separate document
 - e. None of the above

27. Percentage of work time devoted to spreadsheet documentation.

- a. 0%
- b. 1-10%
- c. 11-20%
- d. 21-30%
- e. 31-40%
- f. 41-50%
- g. > 50% and other

Spreadsheet Implementation/Use

28. Number of hours per week of your time normally spent in using a typical spreadsheet.

- a. 0-1
- b. 1-3
- c. 3-5
- d. 5-10
- e. 10-20
- f. > 20

29. Number of other users for a typical spreadsheet you use.

- a. None
- b. 1 other person
- c. 2-5 other people
- d. 6-10 other people
- e. more than 10 other people

30. Frequency of usage of a typical spreadsheet after first use.

- a. daily
- b. once or twice a per week
- c. monthly
- d. quarterly
- e. annually
- f. less than once a year

Spreadsheet Sharing

31. Ways in which you share your spreadsheets.

- a. I rarely share any part of a spreadsheet
- b. I provide a summary of results
- c. I provide parts of the spreadsheet
- d. I share the entire model

32. Frequency of sharing this kind of information with others.

- a. daily
- b. weekly
- c. monthly
- d. quarterly
- e. annually
- f. less than once a year

33. Type of protection normally used for these spreadsheet models when shared.

- a. None
- b. Password protection
- c. Cell protection
- d. Data validation
- e. Other

34. Method used to ensure version control when models are shared with others.

- a. No control
- b. Save the date
- c. Save with version number
- d. Save with user name
- e. Other

Spreadsheet Modification

35. Average lifetime of major spreadsheet models designed or used by you, including refinements over time.

- a. One week
- b. Few weeks or months
- c. A year or two
- d. More than two years

36. Person modifying or refining these models over time.

- a. The original developer
- b. A new developer
- c. Users

Spreadsheet Archiving

37. Method used to back up a spreadsheet after saving it.

- a. Not applicable; no back-up
- b. Back-up to a diskette or a separate drive
- c. Back-up to a main server
- d. Other

38. Information recorded when archived spreadsheets are catalogued.

- a. I do not catalog
- b. Creator
- c. Version
- d. Title
- e. Date
- f. Department

39. Archived spreadsheets serve as a knowledge or reference base for subsequent creators and users.

- a. Seldom, if ever
- b. Occasionally
- c. Frequently
- d. Don't know

40. Frequency of using archived spreadsheets.

- a. Seldom, if ever
- b. Occasionally
- c. Frequently

41. Specific problems encountered with the creation or use of spreadsheets.

42. Practices that have been particularly helpful to you or your organization in improving the quality of spreadsheets or the manner in which they are used.

Training

43. Types of training in spreadsheets made available by your organization.

- a. None
- b. In-house training
- c. Training by external party
- d. One basic session is available
- e. Several sessions, including advanced topics, are available.
- f. Spreadsheet specialist dedicated to assisting designers and users.
- g. Other

44. Topics covered in the training program offered to you.

- a. Basic spreadsheet techniques (for example, copy and past, simple formulas)
- b. Advanced spreadsheet techniques (e.g. use of built-in functions, conditional formatting)
- c. Data analysis (sorting, filter, pivot tables)
- d. Use of specialized add-ins and other tools
- e. Macros
- f. Other

45. Number of days of training offered to you each year.

- a. None
- b. 1 or 2 days
- c. 3 to 5 days
- d. More than 5 days

46. Number of days of training you use each year.

- a. None
- b. 1 or 2 days
- c. 3 to 5 days
- d. More than 5 days

47. The biggest impediments to your further participation in company-sponsored training.

- a. Not enough time
- b. High cost
- c. Poor quality of training
- d. Lack of personal interest
- e. Lack of support from management
- f. Not applicable

48. Incentives offered to you for organization-sponsored training.

- a. None
- b. Organization pays cost of training
- c. Organization provides paid time off
- d. Training is a prerequisite for promotion
- e. Not applicable

49. Probability of participating in training, if made available in your organization.

- a. Probably not
- b. Perhaps
- c. Definitely
- d. Not applicable

Standards and Policies

50. Organization has standards or policies for spreadsheets.

- a. No standards
- b. No written standards, only informal guidelines
- c. Basic written standards
- d. Detailed written guidelines and protocols

51. Standards and policies are followed in your organization.

- a. Seldom
- b. Usually
- c. Always
- d. Don't know

52. Impediments to following the standards offered by your organization.

- a. No impediments
- b. Too stringent
- c. Lack of spreadsheet knowledge
- d. No incentives
- e. No enforcement
- f. Others do not follow the standards
- g. I don't understand the standards
- h. Not applicable

Risk Management

53. Importance of spreadsheets to your organization as a whole.

- a. Unimportant
- b. Moderately important
- c. Very important
- d. Critical

54. Level of risk spreadsheets pose in your organization.

- a. High risk
- b. Medium risk
- c. Low risk
- d. No risk

55. Awareness of your organization of the risk of spreadsheets

- a. Full awareness
- b. Some awareness
- c. No awareness

56. Awareness of spreadsheet risk in your organization since Sarbanes-Oxley legislation (compliance risk)

- a. Yes
- b. No
- c. Don't know

57. Strategies in place in your organization to mitigate the risk from spreadsheets.

- a. Yes
- b. No
- c. Don't know

58. Person in organization responsible for managing the risks from spreadsheets.

- a. The developer
- b. The user
- c. The manager
- d. Don't know
- e. Other

59. Spreadsheet audit packages used in your organization.

- a. Yes
- b. No
- c. Don't know

60. Your gender

- a. Male
- b. Female

61. Your age

- a. 20-30
- b. 31-40
- c. 41-50
- d. 51-60
- e. Over 60

62. Your highest level of education

- a. High School
- b. Undergraduate
- c. Masters
- d. Ph.D.

63. Your position in your organization

- a. Non-manager
- b. Supervisor or manager
- c. Executive
- d. Other

64. Your organization would best be categorized as -

- a. Government
- b. Manufacturing
- c. Service (e.g. banking, retail, consulting)
- d. Agriculture and natural resources
- e. Education
- f. Health/medicine
- g. Other non-profit and other

65. Number of employees in your organization

- a. 1-10
- b. 11-50
- c. 51-100
- d. 101-500
- e. 501-1000
- f. Over 1000

66. Functional area of
your job

- a. Sales
- b. Marketing
- c. Operations/Manufacturing
- d. Engineering
- e. Research
- f. Finance
- g. Distribution, Other

67. Number of people reporting directly to you.

- a. None
- b. 1-2
- c. 3-5
- d. 6-10
- e. 11-50
- f. More than 50

Appendix 2

Data Code Table for the Questionnaire

Q1a	Excel	0=no, 1=yes
Q1b	Quattro Pro	0=no, 1=yes
Q1c	Lotus 1-2-3	0=no, 1=yes
Q1d	Microsoft Access	0=no, 1=yes
Q1e	Visual Basic Applications	0=no, 1=yes
Q1f	Oracle Database	0=no, 1=yes
Q1g	Others	No coding
Q2	Importance of Spreadsheets in job	1=Unimportant, 2=Moderately important, 3=Very Important, 4=Critical
Q3	Experience in Spreadsheets	1=Little or no experience, 2=some experience; still a beginner, 3=extensive experience; some expertise, 4=very experienced; high expertise
Q4a	Any Training	0=no; 1=yes
Q4b	If yes then Formal Classroom Instruction	0=no; 1=yes
Q5	When you work on Spreadsheets you work:	1=By yourself; 2=In a team of 2 or 3; 3=In a larger team (4 or more)
Q6	%age of time spent with Spreadsheets in the job	1=0-25%; 2=26-50%; 3=51-75%; 4=75-100%
Q7	Main purposes of Spreadsheet Use	Descriptive Statistics 1=Maintaining Lists (e.g. Names and Addresses); 2=Tracking Data (e.g. budgets, sales and inventories); 3=Analyzing Data (e.g. financial, operational); 4=Determining trends and making projections; 5=Evaluating alternatives; 6=Others
Q10	Number of different spreadsheets used per week	1=0-1; 2=2-5; 3=6-10; 4=More than 10
Q11	Those who report to you use Spreadsheets to develop recommendations	1=Yes; 2=No; 3=Not Applicable; 4=Don't know
Q12	Are you creator of Spreadsheets in your work	1=Yes; 0=No
Q13	Do you create spreadsheets from scratch	1=Always; 2=Sometimes; 3=Never
Q14	%age of time devoted to spreadsheet creation	1=0%; 2=1-10%; 3=11-20%; 4=21-30%; 5=31-40%; 6=41-50%; 7=More than 50%
Q18	Typical first step in creation of spreadsheets	1=Borrow a design from another spreadsheet; 2=Sketch the spreadsheet on paper; 3=Write the fundamental relationships using algebra; 4=Enter the data and formulas directly into a computer; 5=Others
Q19	Frequency of Use of	1=Always; 2=Sometimes; 3=Never

	system development methodologies (e.g. SDLC, RAD)	
Q20	Best description of your work in creating spreadsheets	1=Work independently; 2=Seek advice from another person(s); 3=Work with a peer group; 4=Work with a project team.
Q21	Other people normally use the spreadsheet you create	1=No, my spreadsheets are for my personal use; 2=My spreadsheets are shared with 1 or 2 others; 3=My spreadsheets are used by a number of people; 4=My spreadsheets often become permanent assets.
Q22	Testing of spreadsheets that you create or others create	1=Never; 2=Sometimes; 3=Usually; 4=Always
Q25	Documentation of spreadsheets (within or separate document)	1=Never; 2=Sometimes; 3=Usually; 4=Always
Q28	Hours per week of your time normally spent in using a typical spreadsheet	1=0-1; 2=1-3; 3=3-5; 4=5-10; 5=10-20; 6=Over 20
Q29	Number of other users for a typical spreadsheet you use.	1=None; 2=1 other person; 3=2-5 other people; 4=6-10 other people; 5=More than 10 other people.
Q33	Type of protection normally used for the spreadsheet models when shared	Descriptive Statistics 0=No Protection, 1= Protection used
Q43	Types of training in spreadsheets made available by your organisation	0= No training, 1= Training provided 1=None; 2=In-house training; 3=Training by external party; 4=One basic session is available; 5=Several sessions, incl. advanced topics are available; 6=spreadsheet specialist who assists designers/users; 7=others
Q45	Number of days of training offered each year	1=none; 2=1 or 2 days; 3=3 to 5 days; 4=More than 5 days
Q46	Number of days of training you use each year	1=none; 2=1 or 2 days; 3=3 to 5 days; 4=More than 5 days
Q50	Organisation has standards or policies for spreadsheets	1=No standards; 2=No written standards, only informal guidelines; 3=Basic written standards; 4=Detailed written guidelines and protocols.
Q51	Standards and policies are followed in your organisation	1=Seldom; 2=Usually; 3=Always; 4=Don't know.
Q53	Importance of spreadsheets to your	1=unimportant; 2=Moderately important; 3=Very important; 4=Critical.

	organisation as a whole	
Q54	Level of risk spreadsheets pose in your organisation	1=High risk; 2=Medium risk; 3=Low risk; 4=No risk
Q55	Awareness of your organisation of the risk of spreadsheet use	1=Full Awareness; 2=Some awareness; 3=No awareness
Q56	Awareness of risk in your organisation since SOX legislation	1=Yes; 2=No; 3=Don't know
Q57	Strategies in place to mitigate risks from spreadsheets	1=Yes; 2=No; 3=Don't know
Q58	Person in organisation responsible for managing risks from spreadsheets	1=the developer; 2=the user; 3=the manager; 4=Don't know; 5=Other
Q59	Spreadsheet packages used in your organisation	1=Yes; 2=No; 3=Don't know
Q60	Your Gender	1=Male; 2=Female
Q61	Your Age	1=20-30; 2=31-40; 3=41-50; 4=51-60; 5=Over 60
Q62	Your highest level of education	1=high school; 2=Undergraduate; 3=Masters; 4=PhD
Q63	Your position in the organisation	1=Non-manager; 2=Supervisor or Manager; 3=Executive; 4=Other
Q64	Your organisation would best be categorised as	1=Government; 2=Manufacturing; 3=Service (e.g. Banking, retail, consulting); 4=Agriculture and natural resources; 5=Education; 6=Health/Medicine; 7=Other non-profit; 8=others.
Q65	Number of employees in your organisation	1=1-10; 2=11-50; 3=51-100; 4=101-500; 5=501-1000; 6=Over 1000
Q66	Functional area of your job	1=Sales; 2=Marketing; 3=Operations/Manufacturing; 4=Distribution; 5=Engineering; 6=Research; 7=Finance; 8=Human Resources; 9=Other
Q67	Number of people reporting directly to you	1=None; 2=1-2; 3=3-5; 4=6-10; 5=11-50; 6=More than 50.

Appendix 3

Summary of the questionnaire survey results.

This also highlights the questions from the questionnaire that were not used for this study in red.

SURVEY ON SPREADSHEET USAGE

MBA Alumni Survey at TUCK BUSINESS SCHOOL '05
(based on 689 responses)

Spreadsheet Usage

1. Please check the types of software you use in your job.

ExcelUse

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	4	.6	.6	.6
	Yes	685	99.4	99.4	100.0
	Total	689	100.0	100.0	

QuattroPro

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	683	99.1	99.1	99.1
	Yes	6	.9	.9	100.0
	Total	689	100.0	100.0	

Lotus123

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	676	98.1	98.1	98.1
	Yes	13	1.9	1.9	100.0
	Total	689	100.0	100.0	

MicrosoftAccess

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	527	76.5	76.5	76.5
	Yes	162	23.5	23.5	100.0
	Total	689	100.0	100.0	

VBA

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	633	91.9	91.9	91.9
Yes	56	8.1	8.1	100.0
Total	689	100.0	100.0	

Oracle

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	639	92.7	92.7	92.7
Yes	50	7.3	7.3	100.0
Total	689	100.0	100.0	

2. Level of importance spreadsheets have in your job.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Unimportant	5	.7	.7	.7
Moderately Important	153	22.2	22.3	23.0
Very Important	226	32.8	32.9	55.9
Critical	303	44.0	44.1	100.0
Total	687	99.7	100.0	
Missing System	2	.3		
Total	689	100.0		

3. Please classify your experience with spreadsheets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Little or No experience	1	.1	.1	.1
	Some Experience; Still a Beginner	37	5.4	5.4	5.5
	Extensive Experience; Some Expertise	429	62.3	62.5	68.1
	Very Experienced; High Expertise	219	31.8	31.9	100.0
	Total	686	99.6	100.0	
Missing	System	3	.4		
Total		689	100.0		

4. Type(s) of training have you had using spreadsheets.

Any training received?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	126	18.3	18.3	18.3
	Yes	563	81.7	81.7	100.0
	Total	689	100.0	100.0	

If yes, then was it classroom based training?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	379	55.0	55.0	55.0
	Yes	310	45.0	45.0	100.0
	Total	689	100.0	100.0	

5. When working with spreadsheets, you typically work:

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid By Yourself	552	80.1	80.1	80.1
In a Team of 2 or 3	123	17.9	17.9	98.0
In a larger team (More than 4)	14	2.0	2.0	100.0
Total	689	100.0	100.0	

6. Approximate percent of time spent with spreadsheets in your job.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0-25%	392	56.9	56.9	56.9
26-50%	199	28.9	28.9	85.8
51-75%	79	11.5	11.5	97.2
75-100%	19	2.8	2.8	100.0
Total	689	100.0	100.0	

7. Main purposes of spreadsheets you use .

8. Techniques used in your spreadsheets.

9. How often each of the following specific spreadsheets tools are used:

10. Number of different spreadsheets you normally use per week.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0-1	50	7.3	7.3	7.3
2-5	319	46.3	46.3	53.6
6-10	172	25.0	25.0	78.5
More than 10	148	21.5	21.5	100.0
Total	689	100.0	100.0	

11. Those who report to you use spreadsheets to develop recommendations.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	472	68.5	68.5	68.5
No	50	7.3	7.3	75.8
Not Applicable	159	23.1	23.1	98.8
Don't Know	8	1.2	1.2	100.0
Total	689	100.0	100.0	

12. *Creator* of spreadsheets in your work.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	67	9.7	9.7	9.7
1	619	89.8	89.8	99.6
2	3	.4	.4	100.0
Total	689	100.0	100.0	

Spreadsheet Creation13. Create spreadsheets *from scratch*

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Always	190	27.6	30.4	30.4
Sometimes	430	62.4	68.9	99.4
Never	4	.6	.6	100.0
Total	624	90.6	100.0	
Missing System	65	9.4		
Total	689	100.0		

14. Percentage of work time devoted to spreadsheet *creation*.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0%	1	.1	.2	.2
	1-10%	373	54.1	59.8	59.9
	11-20%	157	22.8	25.2	85.1
	21-30%	55	8.0	8.8	93.9
	31-40%	22	3.2	3.5	97.4
	41-50%	7	1.0	1.1	98.6
	More than 50%	9	1.3	1.4	100.0
	Total	624	90.6	100.0	
Missing	System	65	9.4		
Total		689	100.0		

15. Division of spreadsheet models into separate, integrated modules.

16. Size of models normally created.

17. How often you separate all data inputs from the formulas in your spreadsheet.

18. Typical first step in creating a spreadsheet.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Borrow a design from another Spreadsheet	157	22.8	25.3	25.3
	Sketch the Spreadsheet on paper	117	17.0	18.8	44.1
	Write fundamental relationships using Algebra	19	2.8	3.1	47.2
	Enter the data and formulas directly into computer	303	44.0	48.8	96.0
	Others	25	3.6	4.0	100.0
	Total	621	90.1	100.0	
Missing	System	68	9.9		
Total		689	100.0		

19. Frequency of usage of systems development methodologies (e.g. SDLC, RAD)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	3	.4	.5	.5
	Sometimes	19	2.8	3.1	3.5
	Never	598	86.8	96.5	100.0
	Total	620	90.0	100.0	
Missing	System	69	10.0		
Total		689	100.0		

20. Best description of your work in creating spreadsheets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Work Independently	498	72.3	80.3	80.3
	Seek advice from another person(s)	51	7.4	8.2	88.5
	Work with a peer group	19	2.8	3.1	91.6
	Work with a project team	52	7.5	8.4	100.0
	Total	620	90.0	100.0	
Missing	System	69	10.0		
Total		689	100.0		

21. Other people normally use the spreadsheets you create.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No, my spreadsheets are for my personal use	73	10.6	11.8	11.8
	Shared with 1 or 2 others	306	44.4	49.4	61.1
	My spreadsheets are used by a number of people	181	26.3	29.2	90.3
	My spreadsheets often become permanent assets.	60	8.7	9.7	100.0
	Total	620	90.0	100.0	
Missing	System	69	10.0		
Total		689	100.0		

Spreadsheet Testing

22. Testing of spreadsheet models that you or others create.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	147	21.3	21.5	21.5
	Sometimes	256	37.2	37.5	59.0
	Usually	164	23.8	24.0	83.0
	Always	116	16.8	17.0	100.0
	Total	683	99.1	100.0	
Missing	System	6	.9		
Total		689	100.0		

23. Which of the following methods used to test spreadsheets.

24. Percentage of time (approximate) devoted to spreadsheet testing.

Spreadsheet Documentation

25. Documentation of spreadsheets (within spreadsheets or in separate document)

SSDocumentation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	155	22.5	22.8	22.8
	Sometimes	345	50.1	50.8	73.6
	Usually	138	20.0	20.3	94.0
	Always	41	6.0	6.0	100.0
	Total	679	98.5	100.0	
Missing	System	10	1.5		
Total		689	100.0		

26. Techniques used to document spreadsheets.

27. Percentage of work time devoted to spreadsheet documentation.

Spreadsheet Implementation/Use

28. Hours per week of your time normally spent in using a typical spreadsheet.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-1	153	22.2	22.5	22.5
	1-3	292	42.4	43.0	65.5
	3-5	119	17.3	17.5	83.1
	5-10	76	11.0	11.2	94.3
	10-20	26	3.8	3.8	98.1
	Over 20	13	1.9	1.9	100.0
	Total	679	98.5	100.0	
Missing	System	10	1.5		
Total		689	100.0		

29. Number of other users for a typical spreadsheet you use.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	86	12.5	12.7	12.7
	1 other person	135	19.6	19.9	32.6
	2-5 other people	364	52.8	53.7	86.3
	6-10 other people	49	7.1	7.2	93.5
	More than 10 other people	44	6.4	6.5	100.0
	Total	678	98.4	100.0	
Missing	System	11	1.6		
Total		689	100.0		

30. Frequency of usage of a typical spreadsheet after first use.

Spreadsheet Sharing

31. Ways in which you share your spreadsheets.

32. Frequency of sharing this kind of information with others.

33. Type of protection normally used for these spreadsheet models when shared.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Protection	490	71.1	73.1	73.1
	No Protection	179	26.0	26.7	99.9
	2	1	.1	.1	100.0
	Total	670	97.2	100.0	
Missing	System	19	2.8		
Total		689	100.0		

34. Method used to ensure version control when models are shared with others.

C

Spreadsheet Modification

35. Average lifetime of major spreadsheet models you use, including refinements.

36. Person modifying or refining these models over time.

Spreadsheet Archiving

37. Method used to back up a spreadsheet after saving it.

38. Information recorded when archived spreadsheets are catalogued.

39. Archived spreadsheets serve as reference base for subsequent creators /users.

40. Frequency of using archived spreadsheets.

41. Specific problems encountered with the creation or use of spreadsheets.

42. Practices particularly helpful to you in improving the quality/use of spreadsheets

Training

43. Types of training in spreadsheets made available by your organization.
(The responses to this question were coded just to identify whether there was any type of training made available to the respondents by the organisation or not)
Identifying the 'types of training' was added by the partner institute for their research.

Is any training provided?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Training	331	48.0	49.6	49.6
	Training Provided	336	48.8	50.4	100.0
	Total	667	96.8	100.0	
Missing	System	22	3.2		
Total		689	100.0		

44. Topics covered in the training program offered to you.

45. Number of days of training offered to you each year.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	332	48.2	55.8	55.8
	1 or 2 Days	164	23.8	27.6	83.4
	3 to 5 Days	56	8.1	9.4	92.8
	More than 5 Days	43	6.2	7.2	100.0
	Total	595	86.4	100.0	
Missing	System	94	13.6		
Total		689	100.0		

46. Number of days of training you use each year.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	484	70.2	80.1	80.1
	1 or 2 Days	91	13.2	15.1	95.2
	3 to 5 days	18	2.6	3.0	98.2
	More than 5 Days	11	1.6	1.8	100.0
	Total	604	87.7	100.0	

Missing	System	85	12.3		
Total		689	100.0		

47. The biggest impediments to your participation in company-sponsored training.

48. Incentives offered to you for organization-sponsored training.

49. Probability of participating in training, if made available in your organization.

Standards and Policies

50. Organization has standards or policies for spreadsheets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Standards	482	70.0	72.2	72.2
	No written standards, only formal guidelines	142	20.6	21.3	93.4
	Basic written standards	25	3.6	3.7	97.2
	Detailed written guidelines and protocols	19	2.8	2.8	100.0
	Total	668	97.0	100.0	
Missing	System	21	3.0		
Total		689	100.0		

51. Standards and policies are followed in your organization.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Seldom	64	9.3	15.1	15.1
	Usually	121	17.6	28.6	43.7
	Always	23	3.3	5.4	49.2
	Don't Know	215	31.2	50.8	100.0
	Total	423	61.4	100.0	
Missing	System	266	38.6		
Total		689	100.0		

52. Impediments to following the standards offered by your organization.

Risk Management

53. Importance of spreadsheets to your organization as a whole.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unimportant	21	3.0	3.1	3.1
	Moderately Important	203	29.5	30.4	33.6
	Very Important	237	34.4	35.5	69.1
	Critical	206	29.9	30.9	100.0
	Total	667	96.8	100.0	
Missing	System	22	3.2		
Total		689	100.0		

54. Level of risk spreadsheets pose in your organization.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High Risk	91	13.2	13.8	13.8
	Medium Risk	254	36.9	38.4	52.2
	Low Risk	262	38.0	39.6	91.8
	No Risk	54	7.8	8.2	100.0
	Total	661	95.9	100.0	
Missing	System	28	4.1		
Total		689	100.0		

55. Awareness of your organization of the risk of spreadsheets

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full Awareness	125	18.1	19.0	19.0
	Some Awareness	360	52.2	54.7	73.7
	No Awareness	173	25.1	26.3	100.0
	Total	658	95.5	100.0	

Missing	System	31	4.5		
Total		689	100.0		

56. Awareness of spreadsheet risk in your organization since SOX legislation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	115	16.7	17.4	17.4
	No	299	43.4	45.3	62.7
	Don't know	246	35.7	37.3	100.0
	Total	660	95.8	100.0	
Missing	System	29	4.2		
Total		689	100.0		

57. Strategies in place in your organization to mitigate the risk from spreadsheets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	119	17.3	18.1	18.1
	No	289	41.9	43.9	61.9
	Don't know	251	36.4	38.1	100.0
	Total	659	95.6	100.0	
Missing	System	30	4.4		
Total		689	100.0		

58. Person in organization responsible for managing the risks from spreadsheets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	The Developer	121	17.6	18.7	18.7
	The User	99	14.4	15.3	34.1
	The Manager	77	11.2	11.9	46.0
	Don't know	305	44.3	47.2	93.2
	Other	44	6.4	6.8	100.0
	Total	646	93.8	100.0	

Missing	System	43	6.2		
Total		689	100.0		

59. Spreadsheet audit packages used in your organization.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	.7	.8	.8
	No	537	77.9	81.9	82.6
	Don't know	114	16.5	17.4	100.0
	Total	656	95.2	100.0	
Missing	System	33	4.8		
Total		689	100.0		

Personal Information

60. Your gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	526	76.3	78.3	78.3
	Female	146	21.2	21.7	100.0
	Total	672	97.5	100.0	
Missing	System	17	2.5		
Total		689	100.0		

61. Your age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-30	65	9.4	9.6	9.6
	31-40	315	45.7	46.6	56.2
	41-50	152	22.1	22.5	78.7
	51-60	94	13.6	13.9	92.6
	Over 60	50	7.3	7.4	100.0
	Total	676	98.1	100.0	
Missing	System	13	1.9		

Total	689	100.0		
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62. Your highest level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Undergraduate	2	.3	.3	.3
	Masters	663	96.2	98.4	98.7
	PhD	9	1.3	1.3	100.0
	Total	674	97.8	100.0	
Missing	System	15	2.2		
Total		689	100.0		

63. Your position in your organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Non-manager	98	14.2	14.5	14.5
	Supervisor or Manager	231	33.5	34.2	48.7
	Executive	292	42.4	43.2	91.9
	Other	55	8.0	8.1	100.0
	Total	676	98.1	100.0	
Missing	System	13	1.9		
Total		689	100.0		

64. Your organization would best be categorized as -

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Government	3	.4	.4	.4
	Manufacturing	124	18.0	18.5	19.0
	Service (banking, retail, consulting)	356	51.7	53.1	72.1
	Agriculture and Natural resources	7	1.0	1.0	73.1
	Education	20	2.9	3.0	76.1
	Health/Medicine	37	5.4	5.5	81.6
	Other Non-profit	14	2.0	2.1	83.7
	Others	109	15.8	16.3	100.0
	Total	670	97.2	100.0	
Missing	System	19	2.8		
Total		689	100.0		

65. Number of employees in your organization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10	117	17.0	17.5	17.5
	11-50	78	11.3	11.6	29.1
	51-100	43	6.2	6.4	35.5
	101-500	88	12.8	13.1	48.7
	501-1000	57	8.3	8.5	57.2
	Over 1000	287	41.7	42.8	100.0
	Total	670	97.2	100.0	
Missing	System	19	2.8		
Total		689	100.0		

66. Functional area of your job.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sales	34	4.9	5.2	5.2
	Marketing	114	16.5	17.6	22.8
	Operations/Manufacturing	41	6.0	6.3	29.1
	Distribution	1	.1	.2	29.3
	Engineering	7	1.0	1.1	30.4
	Research	27	3.9	4.2	34.5
	Finance	246	35.7	37.9	72.4
	Human Resources	3	.4	.5	72.9
	Other	176	25.5	27.1	100.0
	Total	649	94.2	100.0	
Missing	System	40	5.8		
Total		689	100.0		

67. Number of people reporting directly to you.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	221	32.1	32.9	32.9
	1-2	165	23.9	24.6	57.4
	3-5	132	19.2	19.6	77.1
	6-10	92	13.4	13.7	90.8
	11-50	47	6.8	7.0	97.8
	More than 50	15	2.2	2.2	100.0

Total	672	97.5	100.0
Missing System	17	2.5	
Total	689	100.0	

Spreadsheets are important in day to day activity Vs Sector.

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.	21	.241
Likelihood Ratio	25.414	21	.230
Linear-by-Linear Association	.012	1	.911
N of Valid Cases	669		

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Phi	.194	.241
Cramer's V	.112	.241
N of Valid Cases	669	

Spreadsheets are created from scratch Vs Sector

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.	14	.168
Likelihood Ratio	19.260	14	.155
Linear-by-Linear Association	.001	1	.974
N of Valid Cases	607		

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Phi	.177	.168
Cramer's V	.125	.168
N of Valid Cases	607	

Development methodologies are not used for Spreadsheet development irrespective of sector.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.	14	.830
Likelihood Ratio	7.913	14	.894
Linear-by-Linear Association	.588	1	.443
N of Valid Cases	603		

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Phi	.122	.830
Cramer's V	.086	.830
N of Valid Cases	603	

Spreadsheets that are created are shared irrespective of the sector.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.	21	.254
Likelihood Ratio	28.533	21	.126
Linear-by-Linear Association	3.754	1	.053
N of Valid Cases	604		

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Phi	.203	.254
Cramer's V	.117	.254

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.203	.254
	Cramer's V	.117	.254
N of Valid Cases		604	

Spreadsheets testing Vs Sector.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.	21	.284
Likelihood Ratio	24.499	21	.270
Linear-by-Linear Association	2.022	1	.155
N of Valid Cases		667	

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.190	.284
	Cramer's V	.110	.284
N of Valid Cases		667	

Spreadsheets protection VsSector.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.	14	.727
Likelihood Ratio	10.676	14	.711
Linear-by-Linear Association	.027	1	.868
N of Valid Cases		657	

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.126	.727
	Cramer's V	.089	.727
N of Valid Cases		657	

Standards and policy VsSector.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.	21	.123
Likelihood Ratio	34.751	21	.030
Linear-by-Linear Association	4.075	1	.044
N of Valid Cases	662		

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.208	.123
	Cramer's V	.120	.123
N of Valid Cases		662	

Spreadsheets are created from scratch Vs Functional area.

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.	16	.410
Likelihood Ratio	19.133	16	.262
Linear-by-Linear Association	1.339	1	.247
N of Valid Cases	589		

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.168	.410
	Cramer's V	.119	.410
N of Valid Cases		589	

Use of Development methodologies Vs Functional area.

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.	16	.404
Likelihood Ratio	12.702	16	.694
Linear-by-Linear Association	.428	1	.513
N of Valid Cases	585		

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.169	.404
	Cramer's V	.120	.404
N of Valid Cases		585	

Spreadsheet sharing Vs Functional area.

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.	24	.336
Likelihood Ratio	26.162	24	.345
Linear-by-Linear Association	1.070	1	.301

N of Valid Cases	586		
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Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.212	.336
	Cramer's V	.122	.336
N of Valid Cases		586	

Spreadsheet protection Vs Functional area.

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.	16	.965
Likelihood Ratio	8.152	16	.944
Linear-by-Linear Association	1.869	1	.172
N of Valid Cases	638		

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.108	.965
	Cramer's V	.076	.965
N of Valid Cases		638	

Appendix 4

Interviews and Themes (Case Study 1)

From July then we allocate our students to the halls of residence so once the students are allocated they are put on the database with their name and address and

This spreadsheet I use for allocation of the halls to the students.

Comment [MSOffice1]: List for allocation of halls

- Do you use any sums there then?

Just for records...so its more of a database...so there are no calculations whatsoever.

Comment [MSOffice2]: No calculations

- Do you do some sort of annual summary or things like that, such as how many people came in etc?

Yes, we do it, but still I don't really do the calculations on computer, I do them manually, using the calculator and I just then put them in.

Comment [MSOffice3]: No calculations all manually

- Does the spreadsheet that you have created (which is more of a database) link to any other spreadsheet or data source?

No, its just a database.

- Would you consider that SS to be important then?

Yes, very important. It would mean if I double book somebody, or miss out a record, anything like that can cause a lot of problem. If there is a mistake that would trigger off a lot of problems.

Comment [MSOffice4]: Very important in day to day operation.

- Although there is no formulae etc. this still is categorised as a very important SS?

Yes.

Comment [MSOffice5]: Important but not calculative

- Did you produce that SS?

Yes

- But you are not trained at all?

No, I am not trained properly to use them. Well, I know how to use them and that's it. I did learn in the university, but that's all.

Comment [MSOffice6]: No training

- So no course on Excel or anything?

Didn't have any training in house or anything like that.

Comment [MSOffice7]: No training

- This SS that you have do you make any decision based on this at the end of the year, if so then what type of decisions do you use them for?

No, there are no actual decisions that are made on this SS atleast.

- But the information on this SS is fed to decisions.

Just the numbers are extracted. There are only so many halls, so we need to keep a track from the SS such as how many students came in and how many left and

when, and that's it and that's the SS. Just put the numbers down, say 100 halls, these many came in, these many are vacant etc.

Comment [MSOffice8]: Basic tracking

- So does that mean you don't use this information for anything like forecasts, such as how many enquiries you had for the halls etc.?

No, not for that purpose. I don't think we use any SS for that kind of information. We do all such things manually, at the moment!

Comment [MSOffice9]: No calculations. All manually!

Now the other SS records the information, infact I could have done these things on Word as I do all the things manually. We have other means to take care of such information, we get to know how many student applications we have had, we get to know such information from that routes. We just get the information that how many are there, all we do is then use these figured to match to the availability that we have, and there is no use of SS there.

Comment [MSOffice10]: Basic records could have been kept on word!

- Which other SS do you use?

That's all actually. I put them all on word. Ideally, I know they could be used for calculations and may be we can do a lot more. Trying to know and evaluate the choices of campuses, how many went to which campus, as that information would be useful.

(We checked/.....there is no calculations)

- So there is no summation even or no calculations?

Well, no not at all. I just use the calculator and key them in.

Comment [MSOffice11]: Calculator used for calculations!

This information is just extracted and fed to the managers, and then they try to evaluate, how many halls we have how many we need etc.

Comment [MSOffice12]: Used for forecasting halls requirements.

- So although it's a basic SS but information from this is fed into decisions such as expansion of halls, forecasting etc.?

Yes

- Is this information then given to them manually?

Well yes all this information is given to them manually.

- First choice for cyncoed ensuite is this much....etc...so information is imp and is used by the managers, all you do is just record it?

Yes that's right, we just record this information as to what is the preference, etc. but it is definitely used for decision making. Make all the calculations and then feed it further.

Comment [MSOffice13]: Information from SS passed onto management and used for decision making

- I can put formulas in...but I find it lot more easier to use my calculator and just feed the numbers in.
- Are you aware what SS is capable of doing?

Yes, I am aware of it, as I have some knowledge of it.

Comment [MSOffice14]: Lack of knowledge of spreadsheet capability

• Whats the reason behind you not using excel to its potential?
Again I haven't used it much for calculations, I have just got very used to doing it manually. Its an office where we have certain deadlines, have these deadlines all the time. I think we do not have enough time to sit and design a SS with all the formulas in, so that we can use it all the time every year.

Comment [MSOffice15]: Designing SS takes longer.

• Tell me something...if at some stage you had the opportunity to have some training about use of SS and things like how to put the formulas etc. in then would you still prefer doing it with the calculator or actually use them to their potential?

I think I would definitely try to use it more. I think then I would prefer to do majority of calculations using formulas etc.

Comment [MSOffice16]: Would use more if trained.

• So finally which sort of areas do you use them for even if its just for database type of use?

Landlords: SS for landlords..the properties they have, the certificate information of Gas and Electric Safety. It's a standard UWIC requirement, you do have to have the proper certificate for both gas and electric. We have to keep a check on very regular basis.

Comment [MSOffice17]: Landlords list.

Comment [MSOffice18]: Landlord Gas Cert list.

(This SS has a dropdown menu for choices)

We do call up the landlords and check them whether they have renewed the certificate etc or not, and tell them that the certificate is running out etc.

Who designed this one?

Myself. Once again there is no formulas etc.

Who uses this SS?

Myself, Marian and the other assistant. It's the assistant who actually maintains it. She is the one who enters info, maintains it.

Comment [MSOffice19]: Shared with others.

If there is any information in this which is incorrect, then what can be the consequences?

If the gas cert is run out where as the info entered is wrong then there can be a problem as it is required as a standard, its illegal, further if the contact information for the landlord etc is wrong, then once again there can be a lot of problem. Probably there might be a good idea to use some sort of formula to flag up at a certain time in advance that the certificate is running out. Such information can be very useful to us. Like if we did have training in excel we would want to do such a

Comment [MSOffice20]: Would want to use more formulas

thing. We have to go in manually now and just look at the dates to find which one is going to expire. This on its own is very hard.

Supposing somebody else (as 2-3 people use this SS) was looking at the SS and accidentally changed the date???

That would have a huge impact.

- So you don't actually protect that SS?

Well no we don't.

Comment [MSOffice21]: No protection

When I joined...everything was manual. I tried to put everything on computer. So eventually I ended up creating my own things, so we have come to this stage.

Would you say that now that you have got this available it has an effect?

Yes of course the things are lot more easier and efficient with the use of computers.

Comment [MSOffice22]: Spreadsheets are easy and efficient.

- The data in there...do you assume its correct?

Yes. That's something that we don't double check. We assume that the other person has put it in correctly.

Comment [MSOffice23]: No checking or testing

Suppose you were to modify the SS in some way, what would you do, would you save it with the same file name?

I don't get what it means.

Suppose you were to add a column etc. then would you save it with a different name?

Well, no we save it with the same name.

Comment [MSOffice24]: No version control

So you don't have nothing to identify or keep track of the version?

No, effectively if I do something wrong then it would be saved as the original only.

This is available on your hard disk only?

Earlier lian had it on her comp only. To minimise the problems, she was the only one who kept the latest version of it. In other words, just maintain it rather than access it. She is the one who maintains the students and landlord list.

Besides this what else?

Student choices, Landlords, Student allocations. The choices part is the one that feeds into the more crucial decisions such as forecasting etc.

Comment [MSOffice25]: Some involvement in decision making.

If tomorrow somehow you come into the office and one of the three SS vanishes, what happens?

Which one you rely on the most?

We have all the records manual too. We have the filing cabinet with all the landlord details etc. We have to have the paper records. Over the years we have realised that we could not use one without the other. Because it is impossible, as the way we do our operations is slightly unique, if I may say. The applications come in we have to have proper forms, with signatures etc. This was made up for ourselves to make things easier to access the information rather than go through the files etc.

Comment [MSOffice26]: Parallel paper records

So if landlord was supposed to change his tel no. then you have it in writing?

Yes, any change in details goes in the paper records as well. Its usually just one person who puts it on the computer, so there is lesser chances of things going wrong. We just make sure that you could not put it on the filing cabinet, without putting it on the database. Otherwise there would be a bit of a problem.

Comment [MSOffice27]: Parallel Paper records

We also like to keep a paper copy that. For example. The landlord comes and says that the rent I said was £210 rather than £200, so we do like to keep a hard copy as an evidence of the information that we have. Its our proof as well.

Also we have to maintain standard, for example if the gas or electric certificate has expired and we haven't received the new one, then we need to inform the health and safety secretary, who writes to county council. Who in turn write to the land lord and there can be stronger consequences of it. But, we assume that the date that is there on the database is right.

Comment [MSOffice28]: Used to maintain standards i.e. Gas/Electric safety certificates.

Interview with Neil

Mainly I use them for data holding rather than SS and a lot of them are personal ones, for example my Christmas shopping etc.

Comment [MSOffice29]: Data stores

Comment [MSOffice30]: Personal Data stores.

- What do you use SS for

The biggest SS that I have is regarding the UWIC rider which I manage, it is the bus service that runs between the campuses. I use this SS, and record every pass that is sold, the no. of the pass, the name of the person, the date its banked, the payment slip number, and their address, as to which campus they are on. That's my biggest constantly updated SS.

Comment [MSOffice31]: Data store for UWIC Rider

I don't use any SSs per se like for calculations.

- There are no calculations in this?

No.

- What do you use that information for

Of course for auditing reasons. Also, just in case someone lost the pass, I can trace their details, I need to make sure that they bought one. If I can't find them here, probably they didn't buy a pass in the first place. I can search through this using the name and then it gives me all the details of the individual as to when they bought, their address, payment details etc. Well! We sold 1500 passes last year, so it's quite a big SS in size.

- At the end of the year, do you do any sort of manual calculations on this?

It's pretty straightforward actually, 'cause it's got numbers on the side, so I can easily tell from this number how many tickets have gone out, like currently I have sold, 1689 tickets. There are two types, second semester and full year and then replacement passes. To be honest it's just manually calculated.

- So you manually count how many semester 2 passes and how many year passes are sold.

Well yes we can calculate it manually. All I need to do is subtract from the total number of passes the number of passes issued for semester 2, which is only about 70 now and then subtract any replacements from it which is just about 40-50.

- Who designed this SS
Well it's not about designed....

- Who made this SS then?
Well it's me

- Did you have any training in SSs?
I have been on an Excel course years and years ago and I produced graphs etc. So I know how to use it, but there is just no demand for it. There is nothing I can think of where I would find its use. There is nothing I would want to add to what I have here in this SS.

- Is the information from this fed into something else or some sort of decision making?

No, well I mean at the end of the year, I tend to give Freda George and Pam Ackroyd the figures for total sales and things, that's it, but nothing else as such.

- I remember you mentioning that Cardiff Bus sends you an invoice based on this data.

Basically, we get them to invoice us. The passes for the students are subsidised they should cost the students £220 and last year we sold them for £170. The more we sell the more they get subsidised. £50 subsidised on first 500 and then next 200 on £30. Then once we get to 700 we don't break even, but we don't have any more subsidised passes. So once again it's quite simplistic to calculate, manually.

Comment [MSOffice32]: Non Calculative

Comment [MSOffice33]: Used for auditing

Comment [MSOffice34]: Large spreadsheet

Comment [MSOffice35]: Manual calculations

Comment [MSOffice36]: Trivial calculations

Comment [MSOffice37]: Figures fed to management.

Comment [MSOffice38]: Simplistic calculations

- Does Cardiff Bus people ask for information on who was sold etc.? Well its more on trust. They go by the figure we give them. We have been working with them for the last 4-5 years and that's how it has worked.

- DO you keep a record of the back years as well? Probably got them yeah, somewhere.

Comment [MSOffice39]: Archiving unclear.

- What if tomorrow Cardiff Bus asks you for any purpose for example, how did you get your figure for 2002-3? We end up returning the passes that we don't sell. For argument sake, if we had 1300 passes, and we sell just 1200 then we are expected to return the extra 100. We are then charged by the Cardiff Bus for those 1200.

- Besides this SS, do you use any other SS

Kind of but probably just for information only that's it. Lets have a quick flick through them.

Comment [MSOffice40]: Other spreadsheets as data sources as well.

Licenses,

Applications for passes

RiderSS 2003-4

Shopping

Laundry: Its just for recording information. I also manage the laundry for UWIC. Just to keep a record of how many sales have gone through. Record the invoice date and the amount. Just total it up at the bottom.

- DO you do that manually again? Well I use to summation.

As things are differently now and they send a cheque, so its just done yearly now. No onus for me to count it and do it monthly.

Comparison Graph: All data for this is manually entered?

Yes, its all manually entered.

- There is one form a while ago, 2001 regarding our condition survey. They survey the accommodation and decide that we need to spend X amount over the next 10 years, to report to Freda on what we actually spend on maintenance. This is probably the type of SS you are looking for.

Comment [MSOffice41]: Accommodation maintenance expenses spreadsheet.

- There seem to be a lot of formulae atleast summation! I don't think I used a formula or summation, well I did that manually, just calculated and inserted the amount in. The black figures are the ones that we should be spending and are already calculated by Atkins. Red is the actual spendings. It is quicker and easier to do it manually.

Comment [MSOffice42]: No formulae, manual calculation

Same thing for Plas gwyn. Condition survey

Bond payments: Just to keep a record of who have paid the bonds.

Rider Rider

Rider Bible.

Rider sales comparison 04-05

Staff training, just a list of staff and what training they have done.

- Out of the ones that we have talked, how much do you rely on the information on them?

The only one we rely on really, but we do a back up on, is the rider day to day one.

- So you keep the same record manually then as well?

I have to. Each person who buys the pass, we need to record their pass number, name etc. In case I lose the rider one, I know I have the back up in paper form.

- If something goes wrong with this SS or a figure is wrongly entered. Do you feel confident enough to rely on that information?

Its not calculating anything, so I find it more or less reliable. Its just the record, really. What wrong can we enter, if we enter the name wrong, then what, its just a name.

Well if we think about it, its very important at one end, for example if a student says I haven't got my pass at plas-gwyn, we look into this and tell them, well it wasn't supposed to be sent to plas-gwyn, you had to collect it from here. Or is someone says that I bought a pass but not received it, then we can straight away check the details about when it was bought and payment etc. In fact thinking about it, this could have been a simple table in word, but just to keep a record and really quick access to it, its easier to keep it in excel.

Comment [MSOffice43]: Do we really need Excel?

Its not cross referenced with anything or used to produce reports.

It might be a situation that the difference between us as a section and someone like finance we are frontline cust services, so something which might be really important for finance, doing rigorous calculations and stuff, in our case something like this, although its just keeping a record of something, is very important, so that we can handle queries quickly and efficiently. Its surprising the type of queries that we get. In simple words it is actually quite heavily used.

Comment [MSOffice44]: Record keeping only but still very important.

- How many copies of this have you got?

Its just on my computer. I could pass it around, but it gets updated, something like 10 times a day.

- Do you save it at regular intervals for example different versions of it.

No, well it autosaves the whole thing. I change the file name each year. For example this is Rider Bible for the year 05-06.

Comment [MSOffice45]: Version control by name

Sarah Spencer: Cyncoed

Loads and Loads of them:

SS: Sickness Returns

This is taken off intranet, People at HR use it. Designed by HR. Its protected. It has formulas. All I can alter is times.

The other two are different versions. So I call this one as Sickness Returns New One!!!

I keep them all. I don't have to, as that information goes somewhere else. I don't know if this calculates anything, I just fill it up and send it off to HR. That is worked out by someone else. But, I just save it still, as its my record. That's why I have so many of those. I mean its for the last three years.

Sent from Finance

I might have done this one...well I did that.

All this one has is the list of work that we have got over a period of time. It has the dates and the things we have to do by those dates, which I have put in as tasks.

- Do you use that regularly?

No, I used that in 2004 and that's it. That's one of those that I did.

List of accommodations that we got from tourist board. I just save that, in case someone calls its just easy to email this list of accommodation.

This is one of the ones that calculates: This is from HR; In the summer we have temps, as they work with us for a certain period of time, and we want them in work, so they don't actually take leave, they actually accumulate leave. So (as they are part-timers) to work out their leave, we calculate the number of hours they have worked. So HR sent me this, and through this we calculate how much leave they have accumulated and then they get paid accordingly at the end. So this is one where there is a calculation, so if there is a problem with that one, then it would effect how much they get paid. (Formula exists: cant be altered). So this is something which would be very important, as they leave it on us to do. I see it as more of HR Function, but they send it on to us, what I do is fill it in and send it off further and then they get paid. The impact, if this was wrong, to someone who was working over summer, is very crucial.

This was sent to me by a temp, highlighting how many hours they worked and how much we owed them and stuff. It was resolved, but its jut me that I save everything. That wont be used again.

Comment [MSOffice46]: Extensively used.

Comment [MSOffice47]: For sickness returns

Comment [MSOffice48]: List of tasks and dates: Record keeping

Comment [MSOffice49]: Not reused.

Comment [MSOffice50]: Temp staff leave calculation and payslip.

Comment [MSOffice51]: Very important

Comment [MSOffice52]: Save everything even if not used again.

This is from Swansea. Its not calculating. I would have done it in word. This is to do with the code of conduct. Who is responsible for what etc. I just saved it and left it there, thinking when it comes to do mine, I can use that.

Comment [MSOffice53]: Creating code of conduct form.

Contract schedule: Just a list of contracts that we were running in 2003, whom with etc.

List of rooms, not calculating anything.

Comment [MSOffice54]: Non calculative list.

This one, quite interesting, as this one was the critical path stuff, I didn't make my own, I just copied this one. This was done when we were doing the merger. One of the things that came round, about whats going to be done, Etc. We had to list every single thing that we did, and how that correspond with how they do in Glamorgan, and how it will be done together.

Comment [MSOffice55]: List of tasks for merger.

That comes from Finance. Just list

Old sickness returns. And the new ones.

For the fuel.

Another one related to merger. No calculation.

These are the people who applied, install internet in the halls, this was done as a scoring system. We had these, we had to go through every single applicant, against the set criteria. They didn't calculate anything once again. There was one for every company that applied. Purchasing did it for us. (Changeable)

Comment [MSOffice56]: Comparative data evaluation: Done by purchasing.

Comment [MSOffice57]: Not protected.

- You could type a number instead of formula (inadvertently), then save it to the disk and its wrong information saved. So these are quite important.

This is the list we had to do for Freedom of information act. So once again just information and no calculation.

Comment [MSOffice58]: For freedom of information act with no calculations.

Residences Budget: Just information. (There is calculation in the end.) There is no calculation. (There was a formula) Ohh!

Comment [MSOffice59]: Not aware of the formula.

This is my income sheet. Given to me by finance, highlighting what budget I have. Basically the surplus we have created. What ever we use as a budget, the surplus has to go back to finance. SO this is the initial figure from which I work my way backwards. I know what income is going to be, halls fees, car parking, laundry etc. Finance then decides, how much budget to allocate to me. Then from that I create this next one, which keeps track of my expenses in accommodation.

Comment [MSOffice60]: Budgeting

Comment [MSOffice61]: Tracking expenses.

Budget: Who produces that? I do.

The first one, now I do that in word. That is the one I had from Finance in 2002-3, I used that format, and did a table in word and fill that in manually. (She thought she produced it, but now realised that it was given by finance, and it is not know who produced it) All that I use is the word format one that I created and fill the figures in manually, and use it for allocation of budgets, covering costs etc.

Comment [MSOffice62]: Excel file from Finance converted to Word document.

Comment [MSOffice63]: Budgeting and costing

(HR are the ones who protect the SS formulas etc, whereas Finance are the ones who don't!!!)

Comment [MSOffice64]: Interesting Observation!!!!

This was sent to me. Basically there are certain fixed things that are on the budget, such as electricity, as I am told that these are the costs that are going to be for the coming year, then these are immovable ones. So when I am calculating from the budget I have these are the things that go in first, as they are fixed and certain.

Who sent this?

Its sent from Estates Department.

How imp?

That would be imp. If those figures were wrong, wither I should have more to spend on things, and actually have less or vice versa.

Comment [MSOffice65]: Important as it is used for budgeting.

Summer bookings

Any income from students in Unite accommodation at Gabalfa, comes to us as per the agreement that we have with them. So this is just for that. They send us a list.

Comment [MSOffice66]: Income from external accommodation

Training Application forms

Comment [MSOffice67]: Forms

Interview Plas Gwyn:

- Which all aspects do you use the SS for?

Allocating accomm, recording of financial payments (rents) we call it the bible, which records rooms, where they are, what they paid, when they paid, how much they paid, so we keep that going for whole year. If someone leaves, we have to take them off, we don't take them off the bible, we put them in another section, so that we can see that they have been here previously. We don't actually move anyone from the list. But we got paperwork to back that all up anyways.

Comment [MSOffice68]: Tracking accommodation.

Comment [MSOffice69]: Tracking payments

Comment [MSOffice70]: Paper backups.

You keep paper records as well?

Yes, its all about transferring all the paper records to the bible. We need the paperwork anyways, as a back up.

How much are you dependent on this particular SS?

Very, because at a glance, I can chase things, if I have a name or a room, I can chase it up on the bible. Whereas I will need search through several files and several hundred papers to find what I am looking for. So, but at least in the case of this SS I can search it and get the details within seconds.

Comment [MSOffice71]: Very dependent

Besides the Bible, what else do you use SS for?

Alphabetical list, Room list, We also do a separate list as well, for people who owe us first term rent, who they are, where they are from, how much they owe. We tend to highlight them in different colours, International Students, Uk Students. We highlight also for whether they are paying by instalments, and we leave the normal debtors in black and white.

Comment [MSOffice72]: Tracking halls payments

This is a list that has been given to me, who is going to be staying in this week, over the summer etc. We do the recharges, we calculate then how much owed.

Do you use formulas?

Yes, we do use formulas.

Comment [MSOffice73]: Formulas used.

Did you create this yourself?

Yes.

Are you the only one who uses this?

No, Conferences use this as well. Well they first send me the initial information, and I add on my information. I add the calculations etc. We do a recharge for every week. Then we send the information to the finance to arrange with the conferences for the payment etc.

Comment [MSOffice74]: Spreadsheets shared.

Comment [MSOffice75]: Info sent to finance to generate payment requests.

This one is fir Cheque requisitions. We send this to finance, we put do this for refunds. Depending on how much is owed back to the students, the finance raise the cheque.

Did you create this yourself too?

Yes, I created this.

Comment [MSOffice76]: Created by self.

I don't have the bible on my machine. Dave has the bible on his machine. I don't want 2 different versions of it, so in order to avoid duplication, and having two different people amending it.

Comment [MSOffice77]: Bible kept on single machine to avoid duplication

So is it that you have different versions of the Bible?
No, for me here we have just one version which is on Dave's machine.

So how about Cyncoed people?
Well, they have their own version of the bible.

Comment [MSOffice78]: Separate bible for different halls.

The type of information is the same though. But we don't actually feed any information to each other.

When people are paying by instalments, normally they write two cheques, but at times some want to break it down further. Everytime they come in then and make a payment, we fill one of these then. They have a paper copy of the same then, so that they have a running total of what their balance is.

This is what we send to finance for them to raise invoices. We list all the flats and who they are and where they are and the amounts, this does not total on here. It just says who is paying the normal rate and who is paying reduced rate.

Comment [MSOffice79]: Info used for generating invoices

We record the ID numbers and also the cheque numbers that we have received.

- Now onto the other machine

That's the alphabetical list
Block list

We update them all the time, with students coming in late and swapping and changing etc.

This is the bible.

Every block and every flat...who is in there, paid the bond, their first invoice no. what they have paid, when they paid, cheque no. pay in slip no and the date. I am looking to update it now so that it is a bit more friendly. Because I need to know, how much people have paid and so forth. If someone has withdrawn then we put them in red, so that we know that they have withdrawn.

This one uses formulas?

Well this one does not use any formulas, but we would be looking to put something like running totals on the side. So that I can see, what how much we have had per term etc. It needs a lot of work, so its very very basic at the moment.

So the information here, do you feed it somewhere else?

No we don't feed information from here to anywhere else, because of DPA. However we do extract information from this and give it to people like finance and accommodation office, and the actual students. But no body else has it.

Comment [MSOffice80]: SS not shared due to DPA.

Is the information from this used for things like forecasting, budgeting etc.?

No, Not as such yet. That's why I want to modify this, so that I can see at a glance and see how much money is coming in within a set period, and how much money is outstanding. AS I said it does need work on that, but currently its not used for anything like that.

Comment [MSOffice81]: Wanting to make it more informative.

How important do you think these are?

Very, they are crucial. Otherwise it would mean for me to look through loads of files and hundreds of papers.

Comment [MSOffice82]: Critical and very important.

How much do you rely on them?

Well, a lot. We access and extract information from them everyday.

Comment [MSOffice83]: Very reliant.

Do you feel confident that the information on them is correct?
Yes.

What if the information tends to go wrong on these?

Well, At the moment its not too bad, because I can go back to my paperwork and check. If I was relying on this for all that information like for total and everything and like how update it was, like if we have a gentleman and according to our records, he hasn't paid for the second term, whereas he says he has paid, then I need to go back to my paperwork and check. As we say the bible should be the ultimate information source and have all the information on it. Where as currently we have situations where information does get mixed up, payments at times do get mixed up.

Comment [MSOffice84]: Ultimate reliance on spreadsheet

Comment [MSOffice85]: Records still get mixed up.

* But there can be a situation, where student has not paid, and the system has a record that he has paid?

It would as we have to have debtors list, and in correspondence with finance they got a list of all the students and so if no money is coming in then they produce another SS highlighting which students haven't paid, and then I refer to it. If it does not tally then I once again go back to my paperwork and check.

Comment [MSOffice86]: Still relying on paper work.

- You have created quite a few SS, did you learn how to create SSs?
No, its just self taught. I have the initial training, with my office when excel just came out. And that was like 15 years ago and it was a job where it wasn't used much, then I had another job and then this job and with time just have been self taught. And I do find it really useful.

Comment [MSOffice87]: Self taught, trained 15 years back.

You are comfortable with getting formulas and all

It takes a bit of time, as I said that I am self taught, so I don't know a great deal about it and what its capable of. I am sure it can do a lot more and the way I go about it is a bit long winded.

Comment [MSOffice88]: Not aware of capability of spreadsheets

I have just spent about £90,000 here and I had to budget everything and had to get the running total right etc. So I created a SS for it.

Comment [MSOffice89]: Used for budgeting

This SS is summer spending schedule. I have to get quotes etc. And this is something that I send further, so they can keep an eye on our spending etc.

- You created this yourself?

Yeah.

- Seems like quite a few formulas used?

Basically I have the two here. You need to have the information, how many are doing and at what price, then a quote, including and excluding VAT. Then we put in the price. Then it calculated VAT. So I used a formula, so that we have a figure with VAT and without.

Comment [MSOffice90]: Evaluating options: quotes

- So this was sent to Sarah Spencer who further would have sent to finance? Yeah, 'cause can see how much budget she has left and how much I have spent and then we have to rebase things sometimes, I mean at times you need a bit more money to spend. And then that needs to be added on. Its good for me to keep a record of the quotes that I have had and the work that I am having done over the summer.

Comment [MSOffice91]: Used for decision making

Any other?

Well this one, which is just a record over summer for conferences, so that we know, whats coming in and when, so we have every individual flat in one column and all the dates along the other. From this we have a clear record, of what is occupied and what is vacant, when they are leaving, from this I can then tell the cleaners to go in and set the rooms, clean the rooms, when there are bed changes, towels needed etc.

Comment [MSOffice92]: Record for conference occupancy

That's it really!!!

Cyncoed further interviews:

Aug

Rebecca Allen, Receptionist and Administrator.

What all do you use SS for? Do you use SS extensively?

I use Excel, but not for the conventional SSs.

What do you use them for?

We've got ehm for our Alpha list, which is list of names. I use them for creating forms. So they don't actually do anything, they just put things into columns so things are presented neatly on the page. For columns and tables that are far more presentable than using them, in my opinion, in word. I would use them for creating the Management Structure Tree. Again I have done it in Excel, but probably that's not what Excel is for.

Comment [MSOffice93]: Just for creating forms

I mean, I don't do any finance at all. So my purpose for using them is quite limited. I have used it for doing a running totals type thing, when I used to do glorious jobs as summer assistant. So for the conferences period, I do use it for adding up the total number of people that we had staying here.

I suppose that's about it really.

(Now onto the computer)

We would use:

I have created the inventories form. Created in Excel but just for basic purpose. Its not filled electronically or anything. It's a printed A4 sheet. So it was more for presentation than anything else.

Comment [MSOffice94]: Creating a form.

I use it for end of year checks, again that's more informative than anything. Again getting columns from alpha list and rooming list and then adding columns which I fill in due course. Additionally then I change colours, depending on the stage that they are, so that I know, for eg. This one I have had the key back, but its not been checked. I know from the colour, what stage it is. Like this one means, this person is not moving out at all during the summer.

Comment [MSOffice95]: Spreadsheets feeding into other spreadsheets

Student Alpha list

Warden Information

Christmas Days list is just a list, with their names, when they are going and when they are coming back. Again its just a form its not a excel for its original purpose.

Warden log: Its again a form. Printed version used not the electronic version.

All I use them for is creating hard copy forms, because for me they are just easier to present.

Comment [MSOffice96]: For creating hard copy forms

I do use them for the rotas, it's a hard copy information once again, it just not does anything mathematical again.

But the information in them important?

Yes, its very important for my job. It does not assist any decision making, it just assists me and is just informational.

Comment [MSOffice97]: Operational importance.

Like this one gives me the contact details for the wardens. Provides me with a sheet that tells me everything I need to know, but it doesn't assist me in any decision making. I could just probably produce that easily in word. But for me I find it easier and more structured by using it through excel.

Comment [MSOffice98]: Non decision-making spreadsheets

I did on personal level for a decision making process, I was planning on going away for Christmas, so in that one on a personal level I have used it for information to balance up the different trips as to how they balance out in the end cost effectively. That's probably the only one occasion that I have used it for decision making.

I have used it, more recently, to help in coordinating the warden training this year, again I used it for information purpose. And also, again for the first time, to keep a running total of the cost.

Did you use any formulas?

Actually I just used the add up button. But apart from that I would not know how to do any mathematics on Excel.

Did you receive any training in Excel?

No, nothing at all, everything I do is self taught.

Comment [MSOffice99]: No training , self taught

Do you think training in excel would help you do the job better?

It might enable me to use Excel's different functions more efficiently and more effectively. But I don't know whether things like that would be of much of use, as within my role as receptionist and administrator would have any need for them. Probably if I was a finance clerk then I would use them far more extensively for business purposes.

Comment [MSOffice100]: Perception: SSs are for finance

In your capacity the level of importance of SS would be?

I don't perceive that I use Excel for its design function, but for the purposes that I use them for is important to me. So I don't use Excel in its conventional terms, but the way I use them, to me are important. They assist me. The things I create in it, do assist the function of my job. What I create in Excel is important, so the excel package is important for me.

Comment [MSOffice101]: Excel as a package is very important.

Dave Clark, Halls Manager

What do you use SS for?

I use them for more or less everything. All collection of data and financial calculation and number calculations.

Comment [MSOffice102]: SS used for everything

Comment [MSOffice103]: Data Collection

Comment [MSOffice104]: Financial Calculation

Although you can do calculations on a database, but the database which I should be using for all my stuff, is actually so complicated to actually set up in the onset its quicker to chuck it in a SS, although its not the place it should be. I keep information in there, just gather information as one should be doing on a database, I keep that in a SS, because the time to set a database up its easier to do in a SS.

Comment [MSOffice105]: SS is easy than Database

Comment [MSOffice106]: Less time consuming than database.

The individual things I use it for is:

Contract hours,
Student allocations
Alpha lists
Billing
Room lists
Casual lets
Cleaning
Conferences
Conference recharges
Profit and loss sheets
Halls keys
Health and Safety
Infrastructure
Asset tracking
Inventories
Lieu time
Maintenance reports
Keep track of asset forms in rooms
Quotations (who gives best and the worst quote) The cost of quotation
Tracking Cost of the works, in order to keep a track of work costs over a period of time. I put depreciation in it.

Comment [MSOffice107]: USES!!!

So you use formulas?

Not a lot, not as much as I should do, but I do use formulas.

I do the running totals in it.

I do the conference recharges.

I put the withdrawals in it.

I think that's about it.

Comment [MSOffice108]: Not using many formulas.

But what I feel is, and I feel it throughout UWIC as a whole, I think that people under the impression that SS is a database and its not. I think, if there was a simple to use database to logging our data, we just waste SS as SS is so powerful to calculate. And we just chuck information in, where perhaps a database would be better, but it is quick and easy to use. It does the job.

Comment [MSOffice109]: SS are powerful.

All these SS for the purposes you mentioned, you tend to create them yourselves?
Yes.

Do you protect cells, use passwords for the SS etc?

No, me and Diane have a shared drive. Another thing we use SS for is payment by instalments, people paying by instalments, we put them on SSs. We both have access to that and we both have access to alter it. So we have shared drive which we use between us.

Comment [MSOffice110]: SS shared

What I would have liked to have done for this term which I haven't got around is protect half of the SS and I have tried to do it and asked IT if they could do it, because its so busy I haven't got time to do what I wanted to do. So that data in it could be entered half of it by one person and half by the other person, without anybody touching either side. Again the information that we wanted to put in there, database would have been ideal thing for it. But I could have done it quicker, if I do it in a SS. But as it happened we did not have time to do it. So that's gone.

Only me and Diana can alter it, and its because people can only pay me or Diana.

Do you maintain the records in SSs only?

We keep it on paper as well.

Comment [MSOffice111]: Parallel paper records

Do you blindly rely on the data that's there?

Yes, the data we have on SS. Some people feel nervous, when they are using SSs, so they use bits of paper as well. I don't use bits of paper. In the evening what I do is copy a lot of my stuff in my memory stick. Because I am afraid, and feel nervous, incase it gets lost. And if it gets lost it will be a major problem. Although its not very likely, it could still happen, so I copy a lot of it onto the disk.

Comment [MSOffice112]: Over reliant on spreadsheets. No SS no work.

What type of decisions you make using these SSs. ?

The costs decision we make. Costing as to how much it costs us to run a room. So the cost of a room. The cost of people arriving and leaving during the conference period. The cost of cleaning, related to then the length of time. Also payments, as to how much people owe. So we make decisions on that.

Comment [MSOffice113]: Used for decision making.

Comment [MSOffice114]: Costing

The infrastructure and maintenance of the buildings, we look at that monthly to see that where we are going that's in a database and that then decides how much we spend hopefully. It dictates basically, what we spend on, how much we spend and the money we are given is chosen off that. So the decision as to what you spend your money on. And what needs spending money on should be on that as well.

Comment [MSOffice115]: Calculating spending budget.

Do you feed that information somewhere higher level as well?

It is fed up. I think its used here and it is fed up, but whats done with it up further, I don't know.

Comment [MSOffice116]: Information from spreadsheets is fed upwards.

What type of information do you feed up then?

We feed up the asset tracking info. That's fed up once a year. Annual inventory etc. Obviously the annual spending is fed up, that where it comes from. I feed up whats needed doing and why it needs doing and things like that.

The conference recharges, the spending and what money we receive which comes on a SS, that we feed up.

These are the totals, the people who are staying on campus. SO how much money we are getting off them per week that is fed up.

Damages list: what damage etc.

Do you share the SS you create?

Not all, only few are shared.

Comment [MSOffice117]: Few spreadsheets shared.

All the forecasts come to me on SS from conferences. The charges then would come to us from them.

I use it for laundry pick up locations, contractor locations. SO we know where people are going, what needs changing who is doing it, what they are doing and when they are doing it. But there is no calculation in that.

Comment [MSOffice118]: Laundry tracking with no calculations.

TO keep a week by week of the contractors.

I would have thought I use it for more than I could have thought of. I seem to use it more or less for everything. Because its so simple and easy to use.

Did you have any formal training to use SSs?

No, its all self taught.

Comment [MSOffice119]: Self taught

How confident do you feel the models created by you are right?

Pretty confident I think. For what I do, if its wrong, you can see its wrong more or less.

Comment [MSOffice120]: View comment above....but still confident.

Its visual checking you rely on then?

Yes.

The important ones I think the payment ones that are present on the shared drive. I think they are the ones that are real important. As people pay we record it and its easy to know then how much they owe. What we need to do, which we haven't got around yet, make a card and if they pay then put it on their cards. But we use it for too much, I would have said.

Comment [MSOffice121]: Payments/finance oriented are important

Because a lot of things we could put on database, couldn't we??? And we don't do it because, its easy and SS work and do more or less the same, I think.

Comment [MSOffice122]: Easy and quick to do it on SS.

SO in your job what level of importance would you rate them?

Critical.

Comment [MSOffice123]: Critical to job

(then saw the conference SS, which is same as the one in Plas Gwyn and used for same purpose, who is in and when moving out, to send cleaners in to set up rooms etc.

That's it!!!

Themes from Case Study 1 (Pilot Study)

1. List for allocation of halls (Basic informative list, no calculations)
2. No calculations (Non-Calculative)
3. No calculations all manually (Non-Calculative)
4. Very important in day to day operation. (Highly important/Critical)
5. Important but not calculative (Strategic: Important non-calculative)
6. No training (General Observation)
7. No training (General Observation)
8. Basic tracking (Informative and Tracking)
9. No calculations. All manually! (non Calculative)
10. Basic records could have been kept on word! (Information Base)
11. Calculator used for calculations! (Non Calculative)
12. Used for forecasting halls requirements. (Strategic: Important)
13. Information from SS passed onto management and used for decision making (General Observation: Management Reporting)
14. Lack of knowledge of spreadsheet capability (Observation: Lack of Experience and knowledge)
15. Designing SS takes longer.
16. Would use more if trained. (Training needed)
17. Landlords list. (Strategic: Important: No Calculation)
18. Landlord Gas Cert list. (Strategic: No Calculation: Important)
19. Shared with others. (Observation: SS shared)
20. Would want to use more formulas (Observation: Need Training)
21. No protection (Observation: No Protection)
22. Spreadsheets are easy and efficient. (Observation: Easy to use and efficient)
23. No checking or testing (Observation: No testing)
24. No version control (Observation: No Version Control)
25. Some involvement in decision making. ((Observation: Used for decision making)
26. Parallel paper records (Observation: Parallel records)
27. Parallel Paper records (Observation: Parallel records)
28. Used to maintain standards i.e. Gas/Electric safety certificates. (Strategic Very Important: No calculations)
29. Data stores (No Calculation: Trivial)
30. Personal Data stores. (No Calculations: not important)
31. Data store for UWIC Rider (No Calculations: Strategic: Very important)
32. Non Calculative (No Calculation)
33. Used for auditing (Strategic Use)
34. Large spreadsheet
35. Manual calculations (Non Calculative)
36. Trivial calculations (Little calculations but trivial use)
37. Figures fed to management. (Information fed for decision making)
38. Simplistic calculations (Simple Calculations)
39. Archiving unclear. (Observation)
40. Other spreadsheets as data sources as well. (Non Calculative, just for information)
41. Accommodation maintenance expenses spreadsheet. (Strategic: No Calculations)
42. No formulae, manual calculation (No formulae: Minimal manual calculation)
43. Do we really need Excel? (Just Data source: Trivial Use)
44. Record keeping only but still very important. (Record keeping: Critically important)
45. Version control by name (Observation: Some version Control)
46. Extensively used. (Observation: Extensively Used)
47. For sickness returns (Strategically Important)
48. List of tasks and dates: Record keeping (Strategic, Important)
49. Not reused. (Observation)
50. Temp staff leave calculation and payslip. (Strategic Important)
51. Very important
52. Save everything even if not used again. (Information only)

53. Creating code of conduct form. (Trivial)
54. Non calculative list.
55. List of tasks for merger. (Strategic: No calculations)
56. Comparative data evaluation: Done by purchasing. (Important)
57. Not protected. (Observation: No protection)
58. For freedom of information act with no calculations. (Important: No calculations)
59. Not aware of the formula. (Observation: Need training)
60. Budgeting (Strategic: Calculations: Important)
61. Tracking expenses. (Information only: Important)
62. Excel file from Finance converted to Word document. (Trivial)
63. Budgeting and costing (Strategic)
64. **Interesting Observation!!!!** HR are the ones who protect the SS formulas etc, whereas Finance are the ones who don't!!!
65. Important as it is used for budgeting. (Calculative Important)
66. Income from external accommodation (Calculative Important)
67. Forms (Trivial)
68. Tracking accommodation. (No Calculations: Tracking information but important)
69. Tracking payments (No Calculations: Tracking Information)
70. Paper backups. (Observation: Parallel Records)
71. Very dependent (Critical)
72. Tracking halls payments (Informative: No calculations)
73. Formulas used. (Calculative)
74. Spreadsheets shared. (Observation: Spreadsheets are shared with others)
75. Info sent to finance to generate payment requests. (Strategic: information shared with other departments)
76. Created by self. (Observation: Self Created)
77. Bible kept on single machine to avoid duplication (Observation: Some control on strategic spreadsheets)
78. Separate bible for different halls.
79. Info used for generating invoices (Calculative: Strategically important)
80. SS not shared due to DPA. (Observation: Some controls)
81. Wanting to make it more informative.
82. Critical and very important. (Observation: Critical to the job)
83. Very reliant.(Observation: Heavy reliance on SSs)
84. Ultimate reliance on spreadsheet (Observation: Heavy reliance on SSs: Strategic)
85. Records still get mixed up. (Observations: Some mistakes do happen)
86. Still relying on paper work. (Observation: Parallel records)
87. Self taught, trained 15 years back. (Observation: Self Taught)
88. Not aware of capability of spreadsheets (Observation: Unaware of capabilities of SSs)
89. Used for budgeting (Calculations: Strategic)
90. Evaluating options: quotes (Strategic: non calculative)
91. Used for decision making (Used in decision making.)
92. Record for conference occupancy (Important, strategic but no calculations)
93. Just for creating forms (Trivial)
94. Creating a form. (Trivial)
95. Spreadsheets feeding into other spreadsheets (Data shared across SSs)
96. For creating hard copy forms (Trivial)
97. Operational importance. (Important and strategic)
98. Non decision-making spreadsheets (Information only: important but no calculations)
99. No training , self taught (Observation: Self taught)
100. Perception: SSs are for finance (Perception that SSs are for finance)
101. Excel as a package is very important. (Observation: Excel is very important)
102. SS used for everything (Observation: Heavy reliance on SSs)
103. Data Collection (Data Store: Information)
104. Financial Calculation (Calculative)
105. SS is easy than Database (SSs are easy to use)
106. Less time consuming than database. (Timing is the advantage)
107. USES!!! (Observation: Extensively used for various purposes)

108. Not using many formulas. (Non calculative)
109. SS are powerful. (Observation)
110. SS shared (Observation)
111. Parallel paper records (Observation)
112. Over reliant on spreadsheets. No SS no work. (Observation: Heavy reliance)
113. Used for decision making. (Observation: Used for decision making)
114. Costing (Calculative, important and strategic)
115. Calculating spending budget. (Calculative and strategic)
116. Information from spreadsheets is fed upwards. (Observation: Information used for decision making)
117. Few spreadsheets shared. (Observation)
118. Laundry tracking with no calculations. (Important, no calculations)
119. Self taught (Observation: Self taught)
120. View comment above....but still confident. (Interesting observation)
121. Payments/finance oriented are important (The ones handling financial figures are important and more controlled)
122. Easy and quick to do it on SS. (Ease to use and quick)
123. Critical to job (Observation)

• General Observations about SSs.

- No training (General Observation)
- No training (General Observation)
- Information from SS passed onto management and used for decision making (General Observation: Management Reporting)
- Lack of knowledge of spreadsheet capability (Observation: Lack of Experience and knowledge)
- Would use more if trained. (Training needed)
- Shared with others. (Observation: SS shared)
- Would want to use more formulas (Observation: Need Training)
- No protection (Observation: No Protection)
- Spreadsheets are easy and efficient. (Observation: Easy to use and efficient)
- No checking or testing (Observation: No testing)
- No version control (Observation: No Version Control)
- Some involvement in decision making. ((Observation: Used for decision making)
- Parallel paper records (Observation: Parallel records)
- Parallel Paper records (Observation: Parallel records)
- Figures fed to management. (Information fed for decision making)
- Archiving unclear. (Observation)
- Extensively used. (Observation: Extensively Used)
- Not protected. (Observation: No protection)
- Not aware of the formula. (Observation: Need training)
- **Interesting Observation!!!!** HR are the ones who protect the SS formulas etc, whereas Finance are the ones who don't!!!)
- Paper backups. (Observation: Parallel Records)
- Spreadsheets shared. (Observation: Spreadsheets are shared with others)
- Created by self. (Observation: Self Created)
- Bible kept on single machine to avoid duplication (Observation: Some control on strategic spreadsheets)
- SS not shared due to DPA. (Observation: Some controls)
- Critical and very important. (Observation: Critical to the job)
- Very reliant. (Observation: Heavy reliance on SSs)
- Ultimate reliance on spreadsheet (Observation: Heavy reliance on SSs: Strategic)
- Records still get mixed up. (Observations: Some mistakes do happen)
- Still relying on paper work. (Observation: Parallel records)

- Self taught, trained 15 years back. (Observation: Self Taught)
- Not aware of capability of spreadsheets (Observation: Unaware of capabilities of SSs)
- Used for decision making (Used in decision making.)
- Perception: SSs are for finance (Perception that SSs are for finance)
- Excel as a package is very important. (Observation: Excel is very important)
- SS used for everything (Observation: Heavy reliance on SSs)
- USES!!! (Observation: Extensively used for various purposes)
- SS are powerful. (Observation)
- SS shared (Observation)
- Parallel paper records (Observation)
- Over reliant on spreadsheets. No SS no work. (Observation: Heavy reliance)
- Used for decision making. (Observation: Used for decision making)

Themes used for dimensions:

- List for allocation of halls (Basic informative list, no calculations)
- No calculations (Non-Calculative)
- No calculations all manually (Non-Calculative)
- Very important in day to day operation. (Highly important/Critical)
- Important but not calculative (Strategic: Important non-calculative)
- Basic tracking (Informative and Tracking)
- No calculations. All manually! (non Calculative)
- Basic records could have been kept on word! (Information Base)
- Calculator used for calculations! (Non Calculative)
- Used for forecasting halls requirements. (Strategic: Important)
- Landlords list. (Strategic: Important: No Calculation)
- Landlord Gas Cert list. (Strategic: No Calculation: Important)
- Used to maintain standards i.e. Gas/Electric safety certificates. (Strategic Very Important: No calculations)
- Data stores (No Calculation: Trivial)
- Personal Data stores. (No Calculations: not important)
- Data store for UWIC Rider (No Calculations: Strategic: Very important)
- Non Calculative (No Calculation)
- Used for auditing (Strategic Use)
- Large spreadsheet
- Manual calculations (Non Calculative)
- Trivial calculations (Little calculations but trivial use)
- Simplistic calculations (Simple Calculations)
- Other spreadsheets as data sources as well. (Non Calculative, just for information)
- Accommodation maintenance expenses spreadsheet. (Strategic: No Calculations)
- No formulae, manual calculation (No formulae: Minimal manual calculation)
- Do we really need Excel? (Just Data source: Trivial Use)
- Record keeping only but still very important. (Record keeping: Critically important)
- For sickness returns (Strategically Important)
- List of tasks and dates: Record keeping (Strategic, Important)
- Temp staff leave calculation and payslip. (Strategic Important)
- Very important
- Save everything even if not used again. (Information only)
- Creating code of conduct form. (Trivial)
- Non calculative list.
- List of tasks for merger. (Strategic: no calculations)
- Comparative data evaluation: Done by purchasing. (Important)
- For freedom of information act with no calculations. (Important: No calculations)

- Budgeting (Strategic: Calculations: Important)
- Tracking expenses. (Information only: Important)
- Excel file from Finance converted to Word document. (Trivial)
- Budgeting and costing (Strategic)
- Important as it is used for budgeting. (Calculative Important)
- Income from external accommodation (Calculative Important)
- Forms (Trivial)
- Tracking accommodation. (No Calculations: Tracking information but important)
- Tracking payments (No Calculations: Tracking Information)
- Very dependent (Critical)
- Tracking halls payments (Informative: No calculations)
- Formulas used. (Calculative)
- Info sent to finance to generate payment requests. (Strategic: information shared with other departments)
- Info used for generating invoices (Calculative: Strategically important)
- Data Collection (Data Store: Information)
- Financial Calculation (Calculative)
- Less time consuming than database. (Timing is the advantage)
- Not using many formulas. (Non calculative)
- Costing (Calculative, important and stratefic)
- Calculating spending budget. (Calculative and strategic)
- Laundry tracking with no calculations. (Important, no calculations)
- Payments/finance oriented are important (The ones handling financial figures are important and more controlled)
- **Dimensions**
 - **Use**
 - Strategic Calculative
 - Strategic Non-Calculative
 - Trivial/Informative
 - **Importance**
 - Little/Not important
 - Important
 - Critical
 - **Risk**
 - Low
 - Medium
 - High
- **Dimensions Approach 2**
 - **Importance**
 - Low
 - High
 - **Urgency**
 - Low
 - High
- **Dimensions Approach 3**
 - **Dependency/Use**

-
- Operational
 - Analytical/Management Information
 - Financial
 - o OR
 - Operational
 - Tactical
 - Strategic
 - o **Risk Magnitude**
 - Low
 - Medium
 - High
 - o *Time/Urgency*

Appendix 5

Interviews and Themes (Case Study 2)

Interviews Finance Department:

M:

I: access to that spreadsheet but its only read only basis they cant go on and change in the formulas all they can do is look at providing you the. We have taken the spreadsheet what Melanie provides us so if somebody needs and u r on diff grade or diff scale who might not be in the pension schemes where as the previous person was all that info is taken into acct and plugged into the spreadsheet the school cant change or modify its read only basis and password protected. And few people have password. Only Melanie and David has password to get into the thing in this place and then once they can only read. thats all the thing that goes on in the financial dept. certain staff has got access to summary info. Not everybody even if sum1 is on the shared drive.

M: do u have any sort of compliance procedure or things like that in your dept for the data that is stored on the spreadsheets

I: There is nothing written down.

Comment [MSOffice1]: No compliance procedure for SS.

M: We have reached a stage where we can actually if ... u just skim thru the types of use of spreadsheets ... i don't know if u want to verbally tell me..or..

I: We have covered parts already in. not in any particular order. we have used them for forecasting that would be a part of it. Used thm for management reporting. And the both thru different department principal's board..and so forth anybody who need to see financial management report that would be done thru spreadsheets.

Comment [MSOffice2]: forecasting

Comment [MSOffice3]: generate financial management reports

We have used them for top load information into agraso. Manipulate it, to help with what we have talked about like forecasting.

Comment [MSOffice4]: to load information into Agresso

Comment [MSOffice5]: To manipulate information from Agresso.

The main sorts of uses are three uses, forecasting, reporting, uploading to system

.. phone rings..

M: Ok.. this was actually very useful..

This is first interview in your department. If I need anything else I will definitely bother u again...

I: If u will conduct similar interview with other department... many of them will struggle with the questions u have framed..

M: what I spoke to u was a top down approach... them will be more specific into the type of things they do, and what purposes they do.. it will be more user developers kind of quest..

I wanted the top approach ... I thought it's a good idea to meet u and Martin Warren before I actually go into individual sections of your department.

This has given me an overview of what all things happen in your department, and what all type of things you end up using spreadsheets for..
 What I can gather is it is significant use of spreadsheet hopefully, after my research and your feedback of my research it might feature on that register...

M: do u think it should feature on the register..

Comment [MSOffice6]: Unsure if it should be on Risk Register

I: I don't know, Mukul.

M: no thinking abt it.. ...Lets shut this down

Interview 2:

M: first and foremost thing I want to know is what type of job/work are you involved with within the department..

I: Management accounting looking after the schools and the fault departments. I put my priority with management department for academic and research which is funded through the HEFCO so I look at monthly budgets for the department and allocate the budget when they come through and for monthly reporting to the schools and universities.

Comment [MSOffice7]: Management accounting department

Comment [MSOffice8]: Budgeting and reporting.

M: just moving away from spreadsheets how do you perceive risk in generally within your kind of work environment..

I: most is controlled risk in relation to department monitoring they did expenditure insuring that they operate within the budget allocation. Previously we used it in the schools because it's very easy for the school of managements particularly in <> now they have merged that there are conflicts in approaches to the way the schools are run previously and when they are now merged. There is they are ensuring the certain controls are kept. Because of the changes which happens within the last 12- 18 months. Seeing significant destruction to previous systems. Ensuring that the new deans are actually providing with the information so that they can actually manage departments effectively.

Another problem I work on is on European projects. I am involved in developing or reviewing the business plans and the financial information relation to applications for grants.

Comment [MSOffice9]: Applications for grants

M: Do you put in place any ways of measuring the risk that your job tends to entails or do you have any sort of risk assessment or monitoring.

I did came across the risk register which is used by Finance dept. which David Llewellyn

Ended up showing to me so do you contribute to the same thing as well or do you have your own ways of ...

I: the risk I would normally come thru DL because my role is mainly <> as European projects then we have a risk assessment undertaking for each projects and it's

presented to **ECP panel**/ European panel to assess the project risk assessment is done on the project.

Comment [MSOffice10]: Risk management is done for each project.

M: now moving into spreadsheets. What type of.. Do u actually develop spreadsheets yourself..

I: Yes..

M: usually are they one offs or are they regularly used

I: they are **regularly** used

Comment [MSOffice11]: SS regularly used.

M: Do you acquire spreadsheets developed by other people and use them at times as well.

I: **yes**

Comment [MSOffice12]: Developed and acquired from others.

M: Just a general idea what all type of aspects you use spreadsheets for..

I: **business plans**, sort of 3-5 years business plans for units, business plans for projects.. transfer them onto **budgetary** controls

Comment [MSOffice13]: Used for business planning

Comment [MSOffice14]: Budgetary controls.

M: what sort of decisions do you make based on these spreadsheets

I: *It's mainly straightforward use to see if schools are utilising their funds **effectively** so weather they can be over..understanding the budget to ensure that amount to ensure that schools are using the **resources effectively**... on the business planning its looking at the effective financial risk assessment on undertaking **particular** activities or projects and on the european's projects. We also use spshts for **control** and **capturing** the data in the database for beneficiaries are actually employed in projects and collecting information on ..that way..*

Comment [MSOffice15]: Monitor effective utilisation of funds.

Comment [MSOffice16]: Monitor effective utilisation of resources.

Comment [MSOffice17]: Financial risk management for undertaking certain activities, projects.

Comment [MSOffice18]: Control and capturing data for stakeholders.

M: what %age of sprdshts that you developed in you tend to develop. Would you say that created by yourself

I: Probably **70%**

Comment [MSOffice19]: Most SSs self created.

M: so majority of sprdshts that are used are basically self created

I: Yeah, what we have done is that some templates have been worked thru by **system** *template* which we use monitor and control it. They manipulated as in you *data cost center* are actually flagged into the system. There is an exception report which comes out and ensures that any data that's actually been collected is identified so that the reports can be adjusted to include these as in data. Because we actually use sprdshts to interrogate the **financial** system, So we actually use excel report which actually has access to the database **which** leads to financial records. And actually abstracts information back down to sprdshts.

Comment [MSOffice20]: System template used to create designs.

Comment [MSOffice21]: To interrogate existing financial system.

Comment [MSOffice22]: SS have access to the database.

M: so you extract the main system that you have. You extract data from that and use it within spreadsheet

I: Yes

M: and do you feedback information into financial system as well?

I: see, what we reconcile the information that is kept in spsht to make sure there is the information is, the tools **are** correct on our and also we inputs the budgets thru spshts can be uploaded in the beginning when significant changes or reviews. The spreadsheets use in to feed forward information into the **main system**.

Comment [MSOffice23]: To check if tools are correct in the system.

Comment [MSOffice24]: SS feed into the main system.

M: do you have any documentation with the spreadsheets that you tend to use. What do they do? Why do they do and how do they do and things like that.. Is der any documentation wiuth the sprdsht models that you tends to develop

I: **basically little..**

Comment [MSOffice25]: Little or no documentation

M: do other people use the spreadsheet that you tend to develop as well.

I: yes, they **are run** by other. When the template is up and running thn senior finance administrator will run the sprdsht on monthly basis. Sort of interrogate the data once its complete.

Comment [MSOffice26]: Used by others.

M: did u rcv ne official training in job or nethng like that for using/developing sprdshts.

I~: we have rcvd training in relation to the report **writing** in abstract information from the finance system and creating the management report that can add. In relation to sprdshts themselves I think most people sort of have several training but thn its sort of more on experience.

Comment [MSOffice27]: Training on database but SS is more on experience.

M: so more or less, its self taught thru experience and do you use any set methodology when you develop these spreadsheets or is it just thgt and its straightaway you develop the models on the computers.

I: no formal **structure** we tend to look at the problem, identify the information, marked up *information looking for first*. That did out the sprdsht to provide the information.

Comment [MSOffice28]: No methodology.

M: Have you come across any sort of problems or errors when you been using a sprdsht for a little while and thn u realise oh my god there is sumthng wrong in this or there is some model wrong or an error. Probably instead of formula you have a constant or something like that. Thru your exp did you come across any of those at times?

I: **occasionally** if you actually insert in an additional lines thn its having to recollect when you are in certain lines that the calculation are copied thru in certain lines. Log information we using them, **we cross cal** between finance system and sprdshts. So we actually normally information on....

Comment [MSOffice29]: Occasionally errors spotted.

Comment [MSOffice30]: Cross calculations on system and SS

M: so what ever you do on spreadsheets is being done on financial system as well and you can check time and again, so basically you try to have parallel sort of system doing things and then you counter check time and again main financial system that you have.

I: Yes

Comment [MSOffice31]: SS are parallel systems.

M: another thing that I would like to know that in your perception that sprdshts that you tend to use are risky.

I: majority of them are

Comment [MSOffice32]: Agreed that SS are risky

M: ok let me put it in other words. What if the sprdsht you have develop and there is an error in that do you think there will be major problems because of it or minor or have an impact. If tom that one sprdsht has a big error or it vanishes.

I: the risk that we got is that if for some reason we have to sign on <> change than it could result in budget available and the <>

Comment [MSOffice33]: Errors could run risks

M: and even understating at times..probably

I: the understatement is yes it is misinformation

M: it can be.

I: it can be impact on decision making or investment

Comment [MSOffice34]: Can effect decision making or investment.

M: have you have any such example in past where it had an impact on anything thru ur experience.

I: No, the fact that we meet quite regularly with the budget holders

M: Ok

I: doesn't have an impact but some of the to operational spreadsheets have been used where we send the templates where people have kind of amend them and send them back to us we have to ensure we carry out checks because of may be inserted lines, those lines have been picked up or that the change is inserted in the information and as a result some of the reports are not picking up information on reports and European projects and sort of so when they come back we have to re check them and ensure that the cost cast properly.

Comment [MSOffice35]: Need to monitor closely for changes or alterations.

M: Do you have any sort of compliance procedures as well when information is stored on the spreadsheets things like that have you heard about SOX Sarbanes oxley and things like that. It is more of the American side but on the European side we have different legislation and thngs like that as well. Do you build things like that in the spreadsheets.

I: No

Comment [MSOffice36]: No Compliance.

M: ok. That's fine, so in your opinion my ques is coming again. On the risk scale there wld be sprdshts that you think are just basic operational sprdshts and low risk factor but within your working environment do you come across or the some of the spreadsheets that you tend to use are basically higher risk. For if tomorrow information on that goes erroneous or haywire or spreadsheet vanishes all together. What sort of risk your department or your working would have if som,ethng like that tends to happen.

I: these <> to data management and sort of <> run thru separate servers so all information is backed up.

Comment [MSOffice37]: All info is backed up.

M: so you do have back ups and things like that.

I: so that's safe, we have like 2-3 weeks of backup. So we can actually go back and build from information what we have and <> restore where information has been corrupted.

M: do you have any kind of version control on the spreadsheets that you develop. Ok you develop a basic template you work on it, you come up with a newer version and you probably might add in few more lines or few more cells within the spreadsheet models that you have developed. Do you have any sort of version control or do you label them all or anything like that.

I: which <> so actually carry in the when we finalise at the end of the day, we have working version for the month and date. Model that are contained in the month and the files are saved <> department and they are recreated in the following month. So we are always working on the latest models. So effectively we get <> movement on the information

Comment [MSOffice38]: Some level of version control.

M: another question, do you have anyrthng like you protect cells or formulas or anything like that or no? Do you use those kind of control structures as well. So that once you have developed no one else can modify it or thng like that.

I: in some models we use it. Yes,

Comment [MSOffice39]: Some SSs have protection.

M: so yes you do in some of the models. How do you decide ok.. In this model I need to use and in that model I don't need to use it.

I: if its been used in the department then numerous different department can update the model. If its going external thn outside the department where you are not happy who the skill sets, thn we send the protected cells and ask them to drop information on actually using it as a database more thhn anything else.

Comment [MSOffice40]: Protection based on whom it is shared with.

M: ok. Last ques, why do ytopu use spreadsheets.

I: its it can give clear information or advance performance of departments. Inform on timely basis of the performance and we use it as an indicator of future trends.

Comment [MSOffice41]: Clear information

Comment [MSOffice42]: timely

Comment [MSOffice43]: Future trends.

M: this is..what spreadsheets you use for? Or what I am trying to get is. What makes you use sprdshts for all these purposes ?

I: because they show accurate information relation to the performances of the deptt and give projections of future performance. M: easy to use. I: its easy to use and the clarity.

Comment [MSOffice44]: Accurate information.

Comment [MSOffice45]: Easy to use and clarity.

M: another reasonis there any sort of time factor because you got to make decisions within a certain time period and excel is easy to use and quick to use. Is the time factor another criteria when it comes to using spreadsheets or developing spreadsheet models.

Urgency kind of thing

I: yes. It simplifies the way we can actually turn, data runs and to extract information from the system. So it allow us to provide <> information thru the departments so it is meaningful and helpful to the budget managers.

Comment [MSOffice46]: Simplifies info extraction.

M: if the information is not needed that rapid. Would u still use spreadsheet or use something else like databases and things like that.

It's a personal opinion

I: I tend to use , finance system is a database. <>

M: that's what I was trying to get to

I: it's a database, reporting tools in database are quite <> but for consolidating info the spreadsheets are much simpler and easier for deptt managers to use.

Comment [MSOffice47]: Database good as reporting tools. SS good for consolidating info and easier to use.

M: I just had a quick look on the risk register and old version of it which DL gave me. Buit there was bno talk about spreadsheets on that do you think spreadsheet should feature on that or no.

I: yes, because. <> decisions so we should formalise the approach we currently take to it. And ensure that they are the informal checks that we currently do are formalise before our 5 year strategic planning. Sometimes, what I do is <> departments so it is really simple but it's a long cell picking up in the <> budget and is picking up 1% less than it should than it could be problems. But I m sure those checks are in place compared actually between number yes. Than if I put in the wrong information in the spreadsheets or <> thn people cant make decisions and sort of which would impact on efficiency of department of university.

Comment [MSOffice48]: SS should feature on the Risk Register.

Comment [MSOffice49]: Formal approach needed to SS.

Comment [MSOffice50]: Wrong info can impact decisions.

M: covers what ever I wanted to ...

Interview 3

M: : first briefly I would like to know what sort of work are you involved within the department

I: my job title is <> and Enterprise Finance manager so I tend to look at anything which is project related or sourced from external funding. So I am away from general small department type side of finance. Its more external <> commercial work, consultancy, research funding and any arrears within the university which run small independent businesses almost<> framework of <> I see the finances

Comment [MSOffice51]: Enterprise finance manager.

M: so its mainly external projects that you are involve with

I: and small business type set ups if you <> finance involvement. So its like 5,6,7 areas within <> 1. Small business is my area.

M: moving away from spreadsheets a bit how do you perceive risk in general?

I: my work, risk involved in my work is limited compared to outside world and that we are sort of part of the university so you have got the overriding you don't have the cash flow risks and the other things that will be inherent if you are running all these businesses and funding separately but that doesn't take away the fact that we need to understand what the risks are. Because you work in approving all these projects external funding. You need to be aware of the risk in the financial aspects of all that getting into. So, for example if there is a small engineer design business that we got from <> and plans together and say for next year the risk is the same as any other business what you know whats in market, whats on market share. Or development in that business are we forefront of it, are we paying cathup, all those things you know what are fixed <>. How quickly can we react to change in terms of our fix cost blah blah blah...we now see it same as if the risk elements that I am involved with on finance side in termes of businesses not would be the same as outside except we are not going to go bankrupt if things don't take a much change for worst 6 mnths down the line., we are covered if you like by <> evaluate what those risks are and still operate under that basis that its not critical as if we were engineering <>you could be <>

Comment [MSOffice52]: Low risk job.

Comment [MSOffice53]: Need for risk management still high

M: do you assess major time risk that are involved within your work area. Do you have any ways of going things like that.

I: the procedures that we have got in place in terms of the sign off for any project if we had a new contract provider service you know in region of £6 - £700,000. in order for UWIC's board to sign that off we look at the risk and they know the risk would not just be the financial side, our ability to deliver what our contractual position is and the finances. When we enter into contract to deliver we need to go thru that risk assessment process and particularly with things with that magnitude. However, in the <> enterprise office, <> enterprise support unit sorry, they are deviced in a more formal risk assessment for the smaller project, as well, to make sure that the schools have considered all these things. So, at the moment the big stuff is more formal we always have a record of the expected income, cost and everything but what we are

Comment [MSOffice54]: Risk is not just financial risk. Operational risks are there too.

trying to do now is introduce the risk assessment into that process within the smaller stuff. So just to formalize a process that will be probably already <> have we got enough staff and resource. It is to be, can we deliver what we <> academic and deliver that. Do we have some one you knw, all those types of things which you go thru' the thought process which is trying to get some of a little bit of more formal.

M: Now, we will move into spreadsheets. To what extent do you use spreadsheets in your work environment.

I: Massively, from the range that you described in the beginning from sort of little basic stuff thru to forecasting and planning. We just use the spreadsheets just all the time, that's probably not a lot I do, it doesn't involve spreadsheets <>

Comment [MSOffice55]: SSs massively used.

Comment [MSOffice56]: Basic to advanced for forecasting and planning.

M: so its more or less everything related to your work, does run thru spreadsheet at some stage or the other.

I: Yeah.

M: ok, another thing, do you develop spreadsheets yourself as well?

I: Yeah.

Comment [MSOffice57]: SS developer.

M: have you received any sort of formal training in spreadsheets and things like that?

I: yeah, over the years I have been on various excel courses but a lot of the advanced stuff you use, you develop yourself because you almost need to know what you are trying to apply it to get the best out. Because its functionality within something like excel is so massive that you don't know what you have done. You see what I mean. The courses don't actually, cant cover everything. Its almost like you need an issue and you try another <> you sort yourself, trying to find a solution within excel. And that tends to develop your skills and you ask other people as well. You normally, generally within your peer group you can talk to someone like oh yes, we can use pivot tables.ok thn you ask how to do it.

Comment [MSOffice58]: Some training for basics

Comment [MSOffice59]: Advanced self taught

M: so it's a bit of formal training but more of informal peer tips and things like that

I: and using the help and self taught and thinking about that problem how can I use this to solve it.

M: Do you use any set methodology when you develop these spreadsheets models that you tend to use.

I: I have made enough mistakes in the past to know. When you are an accountant anyway, you have always got half an eye on; you don't do things, and just do the numbers by having half an eye on what you expect the outcome to be. So, you are always doing the bit of an idiot check yourself. Even if you are doing on the piece of paper through function, forecast or something irrelevant, you using spreadsheets or

Comment [MSOffice60]: Made mistakes

not. If I was doing something like I have 50 grand surpluses and then somebody casts to me that we need another admin assistant. Without even doing the maths you know that's gonna take that profit down to by 30. so what ever you are doing you can always apply, it should be applying that idiot check any way to what we are doing. You just don't blindly put in numbers and accept. You need to decide.

M: so basically

I: there are so many different levels of spreadsheets anyways, for example this one is something we devised as a form for capturing information for incoming cost on every project. With respect in academics, and the project managers to use this. Because this is something you are expecting others to use. It's really, really straight forward it is literally. Capturing, costing month by month. In this case, when I designed the blank form you just make sure that you test in, testing with a few different projects to make sure the formulas are working in the way you want. But this is a very straightforward spreadsheet in terms of your risk assessment or whatever. These are used for quite small projects and when I get these I do a quick add up and roughly know weather they are right anyway. But in term of the spreadsheet in order to make sure this is working because other people are going to be using it. I just make sure I tested the formulas when you check and check and check sort of things.

Moving on to the lot of the spreadsheets I use for month end because we are trying to do management reporting on various business areas and project. A lot of them are on spreadsheets where these are mainly management accounts where they are being downloaded from the main Agresso finance system. So you will check there if it agrees with the figures in finance system in total. So you rehashed it and divided it by 10 departements we have reported in this way, or that way. But at the end of the day, the bottom line of the Agresso finance system which is proper system, which gives you confidence that the spreadsheet you are working because if you don't you are in a fix. Because when you miss something, or something is wrong you can sort it out. Lot of stuff that we are doing like that you got an independent check in that you are going back to Agresso. So lots of stuff I do like management reporting will fall into that area. Again, more independent stuff that is difficult to make those independent checks that you do in forecasting stuff. So, you now have a business plan which is brought from scratch <> and this is something I have literally started with a blank piece of paper I have tried to keep it really very simple because I need <> to be able to use it and understand it. For eg. I did a draft with the one we were coming out at the certain position. She send a lot of changes that because we needed to improve the position. When I move from that to that I make sure the changes that I have got I know what the movement is going to be, so make sure that forecasters are moved by the way we expect the changes. So you build in your own idiot checks. By the use of making sure <> you have to build in something to keep you comfort that the figures are ok. So, but you can do that at x level and that is probably gives you an idea of the range that I use. I accept what you are saying that when you have got stuff that is complex <> business plans and strategies, and people <> and things like that. <> budget for next year you are always comparative, you are always looking at <> you should be able to pick up some errors because not picking £300 grand to the cost you should be able to spot that because you shouldn't <> you don't do it.

Comment [MSOffice61]: Idiot checks are useful

Comment [MSOffice62]: Should not rely blindly on numbers.

Comment [MSOffice63]: There are different levels of SSs.

Comment [MSOffice64]: Information capturing SS.

Comment [MSOffice65]: Information capturing SS low on risk.

Comment [MSOffice66]: Quick rough add-up is enough.

Comment [MSOffice67]: Management reporting SSs.

Comment [MSOffice68]: Reconfirmat ion of figures with Agresso as a check.

Comment [MSOffice69]: Agresso is the bottom line system.

Comment [MSOffice70]: If fugures don't tally with agresso then there is problem.

Comment [MSOffice71]: Other independent forecasting SSs cannot have same check.

Comment [MSOffice72]: Business Plan SSs.

Comment [MSOffice73]: Strategic SSs.

Comment [MSOffice74]: Only big difference can be spotted. (What about small amounts???)

M: Do you besides those basic checks that you just mentioned the <> I am getting the expected figures and things like that. Do you do any other testing on these spreadsheet models?

I: No, not technically because I would not know how to do them.

Comment [MSOffice75]: Just basic figure tallying with Aggresso as testing.

M: The spreadsheets model for that you tend to develop. Do they carry any sort of documentation with them? Just telling what it does, how it does, what it needs to do and things like that?

I: No <> my notes for this work in terms of expectations rather than technically. The probably the stuff that I develop is not that complex to be honest. The consolidating information for companies, the look up statements <> changing the inflation. It is actually very straight forward technically so

Comment [MSOffice76]: No documentation

M: do you have any other sort of control structures. Do you have any version control For eg. You have modified this to turn into this and things like that.

I: oh yes, that is version 2 and that is version 1.

Comment [MSOffice77]: Some version control.

M: Ok you do just label it accordingly you name the files according to the version.

I: Yeah, I keep a record of changes from here to there.

M: ok so you keep a record of what modifications you have done

I: <> from my own benefit I try and keep <>a lot of variety as well. Keep in all of mine, need to pick a file up. I need to know what has happened to that.<>

M: Ok. Do you have some sort of and spreadsheets which developed by you other people tend to use them as well.

I: some

Comment [MSOffice78]: Some SSs shared.

M: do you have any sort of things like cell protection, or protecting the formula and things like that

I: We have stuff like this when the spreadsheet is going outside. Yeah.

Comment [MSOffice79]: Some protection when sharing.

M: so you protect the cells where stuff is going outside and if it's staying within the department than you don't?

I: no.

Comment [MSOffice80]: SSs within department not protected.

M: on scale of 1 – 5 the extend you use spreadsheet. What will you say?

I: 4

Comment [MSOffice81]: High on scale for SS use.

M: so it is quite extensive.

I: its just because I just use anything I do I would use a spreadsheet. I spent major of my time doing spreadsheets.

Comment [MSOffice82]: Major time spent on SSs.

M: You use information from spreadsheets for all UWIC

I: Pretty much, yeah. <> main system so you need to access stuff like in either main finance system you use spreadsheets to pull it into the format that you use for information management.

M: Within your use of spreadsheets which all different types or preps you use spreadsheets for? What all purpose you use spreadsheet for?

I: well, for management reporting, forecasting, decision making, purchasing for projects.

Comment [MSOffice83]: Management reporting.

Comment [MSOffice84]: forecasting

Comment [MSOffice85]: Decision making.

Comment [MSOffice86]: Purchasing for projects.

M: So, what kind of decisions do you make looking at this information from spreadsheets?

I: just, within different projects, to access the profitability, contribution we are going to make for each one. We also use spreadsheets to pull information out of main accounting system to make any accounts. <>

Comment [MSOffice87]: Used for profitability assessment.

The management accounts and produce various business areas <> management board for decision making <> within the business where profitable whether, we need to make decisions about producing or increasing of <> resources and generally making business decisions based on that financial information makes it a piece of cake. We might have done new spreadsheets to do an appraisal, cost benefit analysis. There is a standard budgeting, forecasting, management report, all that are monitoring and when I go to meetings and we have got management board. <>

M: Now, tell me something, in your opinion do you think spreadsheets are risky?

I: In the wrong hands. Yeah.

Comment [MSOffice88]: SSs are risky if in wrong hands.

M: Even in the right hands if something goes wrong for eg. If tomorrow one of your spreadsheet goes missing. What will happen?

I: spreadsheets are <> they make things quick. This is stuff that you have to do anyways, it will be on paper we can't <>

Comment [MSOffice89]: SS are quick

You have got better checking the mast. They are so much quicker and speeding the process.

Comment [MSOffice90]: Speed up processes

M: so the quick part of it is the key reason why you use spreadsheets?

I: Yes and accuracy. Computers can get things done quicker and you can build in the basic checks. <>

I don't think they are particularly, the level of stuff that I do, I don't think it's particularly risky to be honest. <>

I use it as a tool rather than a

Comment [MSOffice91]: Quick and accurate.

M: Yeah I understand you are less dependent on spreadsheets you use them extensively but if anything goes wrong with them you can recover.

I: I said, that I will hate it <>

Comment [MSOffice92]: I will hate to lose the SSs.

M: that will be a part of my recommendations anyways.

Do you have any sort of compliance procedure or anything like that? Have you ever heard of something called SOX Sarbanes-Oxley?

I: oh yes, I have heard of it.

Comment [MSOffice93]: Hear of SOX

M: there are similar legislation which are but is there anything like that which tells to be

I: I don't know. I don't add any of that to my spreadsheets.

Comment [MSOffice94]: No Compliance.

M: ok. In a nutshell just briefly tell me what are the main advantages of spreadsheets as such while you use them in daily work?

I: it's the speed in which you can manipulate information, where you can present information

Comment [MSOffice95]: Speed to manipulate and present information.

M: there is a third dimension of the model that I am talking about and that we talk about urgency as well. That's ok, time factor people tend to use spreadsheet because you can do things quicker. If you have more time to develop a model or make a decision would you still use spreadsheet or would you rather use a database or something like that.

I: I probably still use spreadsheet that's what it needs to do, isn't it? and that is one of the main things is there responsiveness and that we will be able to do things quickly. You are not using <> if I come out of a meeting and I do something quick when its in my head and put it on the spreadsheets. The information is going into that is probably gonna be more precise than if I left it for 2 weeks to do something else. As much as you write you loose some of the critical details. You might have mixed it. You might not, like lots of things you have not thought of retained in. looking back you used to do things manually, you don't have extensive use of spreadsheets. You will never be able to produce the amount of data in your mind of information for decision making, just wouldn't have the time to do. Unless you, and the cost of planning of information at that level is alarming. You look at to create spreadsheet that's why it came into the

Comment [MSOffice96]: Even if I have more time I will use SSs.

system. There are no bookkeepers any more. The consistent in the spreadsheet can do book keeping.

We are making massive decisions on spreadsheets so they play a big role.

Comment [MSOffice97]: SSs can do book-keeping.

M: Thru your experience have you come across any sort of incidence where spreadsheets were or estimates were wrong and things like that.

I: emm... yeah, probably. I cant think of <> nothing with catastrophic consequences but its not ...

Comment [MSOffice98]: Nothing catastrophic.

M: so, no horror stories

I: no, <> when you are doing your checks, or you try to do something you can sort it out , I can remember when I did last year forecast and I probably inserted a row and some formula and pulled in a total then adding the line at the bottom and when I did notice it is that because I had not put in the cross total which I would normally do. It was only couple of grands, so it wasn't the end of the world. But this was one thing that was very important <> that in the end <> that you have done over the years that make you <> I need to, you are looking for independent checks yourself because you need to confirm that you havent messed up. <> but if not, if the materiality of things as well, had it been £20k I would have noticed it. As it was only £1400 I didn't, you know, so the materiality <> as well. You should pick up if it would have been any worse, technically on the spreadsheet the problem added to same thing but you more likely to notice it if its high error which is hopefully, <> there are errors on them except the are probably

Comment [MSOffice99]: Error worth couple of grand.

Comment [MSOffice100]: Quote!!!

Comment [MSOffice101]: High errors are more likely to be noticed.

M: coming from that, just a very last, very basic question psychologically would you handle a spreadsheet with the bigger amount with more care as compared to a smaller amount spreadsheet when you are handling?

Yes probably, yes logically I would. Yes. The more detail you have got and stuff the more you cant instantly tell, so you have to be a bit more careful.

Comment [MSOffice102]: SS with bigger amount will be held more carefully.

New Interview

M: so to start of just quickly we would like to know what type of work are you involved in the department.

I: I am the information and systems accountant so I beat my head against the wall most of the time. I look after AGRESSO and finance system. So if we have upgrades or we got system maintenance or we need to do some testing or development that sort of lands on my desk and also <> transition to sharepoint but then here and it comes to me for, probably it comes across accelarator, which is the report writer which so I get asked to start reports and pass them over. So I sort of deal with the system side of the finance department.

Comment [MSOffice103]: Looks after Agresso and the finance system.

M: right, OK. Moving a step back, in general, how do you perceive risk within your work environment?

I: I don't really

M: Ok

I: because most of the things that I do are one of the exercises or I suppose you do a lot unconsciously but I am not you think of a project what is the risk involved but you don't some other major concerns I don't do a risk assessment on what we are doing

Comment [MSOffice104]: Not involved in any risk assessment.

M: moving on, then we can straight away move into. Ok. Do you use spreadsheets within your

I: yeah. We use a reporting tool in excel which you built a report and you load information and it pulls it out of the finance system and into a format that you can setup which is quite a big part of our reporting in finance. All the management reports are sent out and that's all done thru excel.

Comment [MSOffice105]: All management reports are through Excel.

M: ok, do you develop spreadsheet models yourself

I: Yes, with an accelerator.

Comment [MSOffice106]: SS developer.

M: Did you have any formal training with excel?

I: when I first came here I have been on couple of excel courses and I have been thinking for a while I would like to give another one because I have to ask my husband I get rusty on VLOOKUP and Pivot Tables and I ask 'How do we do this?' and he talked me thru' it.

Comment [MSOffice107]: Been on some Excel courses.

Comment [MSOffice108]: Seek help from Husband.

M: So your husband is an expert

I: Yeah.

M: ok. So you do develop spreadsheets. Do you use any set methodologies when you develop these spreadsheet models?

I: No

Comment [MSOffice109]: No methodologies.

M: the model you tend to develop do you have any sort of documentation

I: Yeah

M: which is?

I: well, it is just the training notes that come with the modules with the accelerator.

Comment [MSOffice110]: Some documentation.

M: so you do have <>

I: oh yes, I have been on training course to do that.

M: right, do you use any othe control structure things like cell protection and things like that to develop.

I: I always, another sort of things I do well is one off exercises <> past it or not

M: so you mainly end up getting involved in reporting side of things. Do you actually analyse the figures

I: I would do. If I was to see report for Martin and I would say I would look at what finance system says and the report that I have written in just to make sure that the bottom lines are all the same. I do analyse that the bottom line figures matched.

Comment [MSOffice111]: Reporting.

Comment [MSOffice112]: Check the bottom line figures with agrapho.

M: Are you involved with any sort of any level of decision making when it comes to analysing these figures

I: No, I just produce the information and then pass it on

Comment [MSOffice113]: Not involved in decision making but pass on information for the same.

M: ok, so you don't make decisions

I: No

M: have you come across, during your work environment, have you ever come across major errors that you ended up producing and then it had a problem later on and the impact was there in the developing of the spreadsheets

I: Not really, No.

Comment [MSOffice114]: No major catastrophes witnessed.

M: If I were to ask you on a scale of 1-5 how would you rate the use of spreadsheets within your work that you end up doing what sort of involvement does spreadsheet have on the scale of 1- 5

I: 21/2 It comes and goes, it comes there could be a time this particular problem needs to be done or and than I spent a lot of time doing it, but than it comes in blocks.

Comment [MSOffice115]: Part of the job is with SSs.

M: Within your reporting skills did you have any compliance procedure and things like that?

I: To who?

M: compliance have you heard about things like Sarbannes Oxley? There are equal regulations and things like here.

I: No I don't.

Comment [MSOffice116]: No compliance.

M: Also, in your opinion do you think spreadsheets are risky?

I: I hadn't thought about that ever. I always thought that you know that it was safe rather than doing manually I thought you know, you can put it on spreadsheet you were pretty safe than.

Comment [MSOffice117]: Never thought SSs are risky.

Comment [MSOffice118]: Quote????

M:so, you used to you said <>

I: untill you mentioned it. I didn't even realised there was any risks.

Comment [MSOffice119]: Was unaware that there are risks with SSs.

M: Now that we have discussed whats your opinion about risk associated with spreadsheets because I did come across the risk register which is one version that I ended up having a look at which was finance department risk register but somehow spreaddheets don't feature on them so in your opinion

I: what I think most of us will say that if its in excel its safe, like you can believe what you store.

M: So what kind of checks do you use when you develop these reporting tools?

I: well, like I said before I would check that we just have a control total at the bottom. So that we know that, that would match whats on the finance system so it picks up all codes, all accounts so we always want the control total and that is a built in check within our spreadsheet so we know that everything is included and that figure is what is on our finance system. And we also, in lot of are reports we have another line at the bottom that will pick up anything that we havent included in the top so we always got a control at the bottom. And usually if you do a report on a particular thing like fees you would always go back to the finance system to make sure that your...

Comment [MSOffice120]: The key check is to look at the bottom figure and tally with a gresso.

M: so your finance system tends to be the check all the time?

I: yeah, because that's what we are finally going to report on and that's why everybody is going to see since that our reports matched with the finance system

Comment [MSOffice121]: Check with a gresso.

M: so, effectively what you end up doing is running your information slightly in parallel and then keep counter checkings

I: you wouldnt keep checking because you have control total at the bottom that ensures that you are picking everything up and in other reports you would just do the final check at the end. So you would format the report make sure the reports look right and at some point all you would do is when you get your first figures is to check

M: So if the figures look reasonably ok

I: well it has to be spot on from the finance system. We don't say we are there about. The figures on the finance system should be same as that on reports.

M: so yours is basically, just for basic financial reporting the use of spreadsheet

I: Yes.

Comment [MSOffice122]: Just financial reporting use.

Next Interview (THREE RESPONDENTS)

M: I would like to know what type of work your are involved in. if you want to tell me one at a time.

Lady 1 - Lynn: I basically work more in analysing the figures that we have on the salary budget.

Comment [MSOffice123]: Analysing salary budget figures.

M: You have involvement in basically designing models and developing the forecasting

Lynn: No its developed by Martin who already have a spreadsheet which is hold that information so its generally the update of that. Integrity of that, but involved in that also in the beginning of the year <> information in the finance system. So that spreadsheet is used at the beginning of the year to forecast the next financial year's budget on course salary. So all the information is in there is then converted into powerful matrix that we can upload into AGRESSO the monthly growth play on any cost, into the AGRESSO system as a busdget, so that involves macros to do that. That's it really.

Comment [MSOffice124]: SS developed by someone else.

Comment [MSOffice125]: Develop next financial year' budged on course salary.

I 2: Senior finances sytem, run the management reports <> which is the main. Dave and Martin they use to do there forecasts and know where they are going financially. The spreadsheet itself is already being setup but its unloaded and loaded again and any amendments which are slot into the spreadsheet. Basically that's about it really in terms of use of spreadsheet like things I do in excel which we used to check controller counts. So, you know there is sort of like we do advance expenses which <> my information on the advance expenses is put on to spreadsheet which I do in excel, I have got few of those setup for the days to come, mainly the reports are like the others told you about that we use. Departmental management reports which sent out to the heads of departments like in salary monitoring that they can checkthe budgets and know where they are going, do every month.

Comment [MSOffice126]: Running management reports.

Comment [MSOffice127]: Managemen reports for head of departments.

M: so its mainly you are involved with management reporting and things like that

I2: Yeah, but not so much of loading and checking that they are balance to the specific degree of going out to these people and saying, sort of produced for there information, to let them know. So they manage obviously the budget themselves so we run it for them so they got an idea of where they are.

Comment [MSOffice128]: Budget managed by others, we only give figures.

M: OK, Rachel

Rachel: I do management report for Healey so I run her management report again unloading, loading, amending them if there is any extra information or new sheets on them really and its basics worksheets if we are doing any sort of work that can make it easier for them.

Comment [MSOffice129]: Load, unload and amend SSs from others.

M: are you at any stage involved with designing of these spreadsheets models? Or were you involved when these spreadsheets models were designed or they have just been passed on to you or in your own capacity do you design spreadsheet models?

Rachel: no, again to help what we currently do is can be of resistance but the bigger departmental report are being handed down and designed by others.

I2: yes

M: what kind of spreadsheets do you get involved in designing of for eg. Like the type of spreadsheet you would design yourself.

I2: I think its mainly with anything to help with day to day jobs that we may extract information for the finance system which we can quite easily pop into an excel sheet and manipulate the information to how we want it to look ourselves in that way.

M: what purposes do you reckon would you use

I2: well, like I said the spreadsheets reconcile an account because we have got commercial to UWIC and to main UWIC account. The money transferred between the two so, to make sure that balances between the two companies are created a spreadsheet to show there is inbalance. Low key stuff nothing too complicated. But things like that which we use for one day, <> I can use my little spreadsheet too, to help me do them. Sometimes in excel its easier is to sort this information and than on the finance system.

Comment [MSOffice130]: Design low key SSs.

M: How about yourself? Are you involved in the design spreadsheets at times?

I2: No, only Suzy uses the management reports sometimes Hailey wants a new report run but we run the copy of the old and then turn it into new information that she wants. But basically the part of the old format and alter it. It sort of that system and then we copy it and alter it that way. Not starting from scratch really.

Comment [MSOffice131]: Non developer, just user.

M: Ok, but you two do tend to get involved from scratch at times.

I1: they are pretty basics

Comment [MSOffice132]: Just basic SS design.

Man: I would say most of the things I think anybody will do in finance, is using the tools in AGRESSO because our browser enquires which you sort of, set your own spreadsheets. Its using the tools from the actual finance system so like you suggested that it's the outcome of the spreadsheet which is being created, it gets to amend itself for you to be able to do that anyway. That is what all of us will all do if we do certain

kinds of enquiries to create the spreadsheets its using AGRESSO itself. That's why I asked the question.

Comment [MSOffice133]: Spreadsheets created using Agresso

M: Agresso ends up creating the spreadsheet for you and the information is already loaded up but you need to do something

Man: generated and how it looks.

Lady 1: presentation of it.

M: and what these spreadsheets does is on you as well is to once you get the figures from AGresso what it does to those figures is also you end up designing that

Man 1: like in a game like the management reports which would already set a sort of a template so we can create another management report from the other department. But because we are sort of bound to how they want it to look which will be expenditure, budgets, like the certain things need to be in it. So, we don't often go outside that ring.

M: so all three of you are involved basically you feed information that you extract from the spreadsheets to higher management. Do you yourself as individuals involved in any decision makings?

Lady1: No

Man1: No

Comment [MSOffice134]: Just feeding information from SSs to management.

M: What type of decision making do you feed into then?

Lady: Mine will be Salary based interrogating a finance system and interpreting the information on the question that has been asked by the management. so if they want to know how much overtime we spent in certain areas. So that information comes out of Agresso manipulated on a spreadsheet and presented in that way. So its that kind of information that we give in.

Comment [MSOffice135]: Salary based decisions.

Comment [MSOffice136]: Overtime budget decisions.

Man1: and again using that example is that HR asking to give them a list of all the payments we made to agency recruitments so that can be ACORN and quite a few of them so we just cant make a list from AGresso. We do need to transfer them, because they want it in certain periods so that's what I did yesterday and I got the information out from AGresso and stuck it on to excel sheet for him format it and give. So that's within finance is my view is lot of people actually do and <> don't often make a decision on what the spreadsheet says. That's something for Dave and team

Comment [MSOffice137]: Extract info from Agresso, format it and feed to management for decisions.

M: so they give you the requirement that this type of information I need so you are the ones who ends up designing a spreadsheet or extracting the information and manipulating it. Ok, any of you have any formal training in excel or spreadsheets as such

Lady 1: yes, In house training, intermediate level

Comment [MSOffice138]: Some inhouse training.

Lady 2: No I haven't

Comment [MSOffice139]: No training.

M: Once you develop these models that you tend to have which is manipulating the information do you test it in anyway or do you have any ways to keep an eye or check on it

Lady 1: we don't worry because the control figures comes from Agresso. However you are manipulating or present your data the bottom line financial figure should tally from what information you have pulled out.

M and that's the only check you tend to use is it. Control balance. Right, the model that you develop does anyone else use them at times as well or no within the office?

Man1: yes, because the outcome is not sole ownership. Anybody who has got access to the drive its on can load it and can also manipulate, or change things

Comment [MSOffice140]: SSs shared and can be used by others having access to the same drive.

M: ok, so you don't actually protect your spreadsheets, cell protection or formula protected or anything like that.

Man1: the only thing that I might do is on quality based because these reports are run every month that if there are lots of changes to the outturn because if they ask me or Glyn or anybody could you stick this into the spreadsheet. I may physically upload it which shows the formulas, it is a bit tedious but effectively the > you could rebuilt at a certain point in time but it says

Comment [MSOffice141]: Protection only if shared outside the department.

M: so within you department anyone can modify?

Man: Not anyone, its only some people who got the access of the drive in finance.

Lady1: Not anyone because its password protected. When this is distributed as a management report to the budget holders as they have access to Agresso accelerator or excel anyway they wouldn't be able to do anything with the data.

Comment [MSOffice142]: Password protected.

M: those are the spreadsheets that tend to exist on the shared drive. Do you tend to have spreadsheets on your own hard drive as well?

Man: Low key

M For eg? What purposes would they be for?

Man1: well, just say that reconciliation of accounts to let me know who owes there advances. Because if we just look into agresso it wouldn't just tell me everything I need to.

Comment [MSOffice143]: Basic info like who owes advances.

M: so what all that Agresso tells you is the big figures and not the nitty gritty?

Man It will tell you if you want to but it doesn't tell you in a format that I know the date the advance was issued, the amount outstanding, any returns

Comment [MSOffice144]: Agresso does not give in the format that is needed.

Comment [MSOffice145]: SS used to have info in the format that is needed.

Lady 1 combination of information coming from Agresso and the information that we have from other sources

Man1: but which is a spreadsheet is about 5 columns long simple formula

Lady 1: I have got one for the NHS bursaries we have got the NHS who give our students certain amount of money to come and do the courses here so that information is given to me by the NHS. Their names and the amount that is to be spread over a number of months payment. So I used that spreadsheet to calculate the monthly payment and then generate a payment schedule for those students.

Comment [MSOffice146]: To record information from external sources.

Man1: that's another good example because something that we all do is that we get information externally. There may be a lot of students that needs bursaries NHS is one which we can put on to a say, an excel spreadsheet but its caught between like in a back interface file that we can take that from the spreadsheet in stick into the finance system the main finance system which then will produce payments or I mean, and budgets could be done like that as well. So its information externally on to the spreadsheet uploads in the finance system. Which we can create that but the tools that are within Agresso for us to do that.

M: What level of confidence do you hold in the spreadsheet do you hold that you design yourself.

Lady1: because they are basically very simple, we have a high confidence in that because it is basically a sum.

Comment [MSOffice147]: High confidence as basic SSs.

Man: Some information where you have a supplier ID which I suppose you could get wrong. Which is probably the only thing you may not really notice initially but most spreadsheet can go in like budgets, the bursaries like you mentioned earlier there is a bottom line balancing figure so you know that spreadsheet total sum is same as the other sum totalled the £1000 that once get into Agresso you can then check that you have transferred the £1000.

Lady1: but then you can have human error like if you are extending the list on a spreadsheet your sum may only come down that list incase your bottom line total isn't accurate.

Comment [MSOffice148]: There is scope for human error.

M: In the end the eventual checking is mainly just the cross total and if at times and as long as you get that close to or more or less same as what is expected you think that the spreadsheet is fine.

Lady: yes

Man: yes, and also where you think it should be in agresso is there.

M: The model that you develop for ffeeding information to people do you give themj any documentation with the spreadsheet or tell them what your spreadsheet model is doing or how you came to that information and things like that.

Lady: what they want and we just come back with it. They will tell us what is required.

M: you don't turn around and tell them how you came to that figure?

Man: No

Lady: No

Man: Most of those reports are loading and unloading them up and with the outturn in particular which is one that we are using today Its got a self sort of balancing figure at the bottom. So the report itself checks itself than I cn go in it and interrogate it to see where the error may be or why its not picking certain. So you just actually give them the physical document that you print off. There is no sort of how we came about it because we know that what report is looking at them. It's from that we all know its in there and what it is doing

M: within your experience with spreadsheets have you ever come across an error which effected and what was your approach about it?

Lady1: Yeah, because with each European project we tend to copy the format from the previous <>project unless you actually going in and physically check that the format is going to work right for you then for that particular project, I have had incidences where the figures have been slightly wrong until you check that. It's the gut feeling that its wrong.

Comment [MSOffice149]: Errors do occur until you check it.

Comment [MSOffice150]: Gut feeling matters.

M: So its more of a gut feeling test?

Lady: yes

Comment [MSOffice151]: Gut feeling testing applied.

M: when you have such an error how much of the amount differ by for example?

Lady: It could differ by quite a lot. If you haven't picked up the right cell from another worksheet so that's what I am saying if you are referring from another worksheet and the right cells aren't picked it could have a large impact.

Comment [MSOffice152]: The impact could be large.

Comment [MSOffice153]: Usually occurs when getting figures from another sheet.

M: did you have any examples of for eg. If you are putting a bid for European project

Lady 1: no its nt been. Its usually been on interim claim.

M: and how did you end up detecting something like that?

Lady1: for instance the figure was £10,000 one month and its gone down to £8000 the next month that's how you spot the difference that your are not referring back to the right worksheet because its giving less money rather than increase.

Comment [MSOffice154]: General figure value is the only check.

M: Have you come across any such example?

Man: Only again back to the outturn that can go out of balance from a penny to 10s and 1000s of pounds. The approach to finding that is thru experience in terms of that we all been said what could happen so we know that the outturn could be out because its not attached to a certain relation so this sort of methodical approach to look in for the error on spreadsheets going back into their finance system mainly. And if finance system we cant find it then possibly look to see any corruption in the actual spreadsheets. For eg. Its not picking up cells but there are certain things that we know we can do initially to find the error. As I said it could be from a penny to few 100, 1000 pounds. But nothing goes forwards it wont be presented on paper until.

M: so no horror stories from your experience.

Lady: No

Man: No, it's a nuisance. It can be pulling hair if you're not able to find it but nothing that would come back and bite you because it has been presented with an error.

M: have you had a compliance procedure? Do you have anything like that in place for your spreadsheet models? That ok the information that goes on that should be auditable and things like that? Or in another words when the audit takes place are the spreadsheets ever audited?

Lady 1: by external bodies?

M: whichever, by internal or external audit, the spreadsheet models that are developed by staff, not just by you guys even the models that are developed by people up there.

Lady1: I wouldn't say audited.

Comment [MSOffice155]: No audits no compliance.

Man: I don't think they are interrogated as a spreadsheet. They might in terms of procedure say like if you have got this noted and recorded because they are monthly spreadsheet they might say where is the physical spreadsheet for this because sometimes they don't like to see well, oh its on the system. They like to see hardcopies. But spreadsheet itself is not interrogated and audited in that way.

M: Have you heard of something called Sarbanes Oxley?

Man: No

Lady: No

M: It's more of an American thing but we have equivalent procedures here but its quiet a lot creeping in the European. It is that any financial information that you hold basically should be auditable. So that brings spreadsheets into audit circle as well. Whatever information, whatever manipulation of information has been done or calculation has been done, should be auditable and things like that. You aren't aware of it yet anyways. That's fine. Last question is what makes you use spreadsheets?

Lady: They make life easier. They make your job easier. If the information is there rather than even like the simple adding of column of figures, you don't have to use the calculator its just a couple of clicks and its done.

Comment [MSOffice156]: Convenient

Comment [MSOffice157]: Easy to use

Comment [MSOffice158]: Calculations on clicks.

M: So, its basically convenience and ease

Lady Yes.

Man: exactly the same. It's easy and quick. Presenting information is easier to do but really mainly convenience

Comment [MSOffice159]: Easy and quick

Lady 2: its easier to put the information on to it and sort it and present it. Make it look understandable. You can put rubbish in it and sort of put it where you want it. It's easier to read.

M: If you have more time will you still use spreadsheets or rather use something else?

Lady 1: No

Comment [MSOffice160]: Even if more time is available, still will use SSs.

Man: No, Ever since I know have used spreadsheet. There was a time, lynn will remember this we used to do management reports with Super Cop and that two weeks and that you can do in an hour today with the spreadsheets that we are using so to go back to anything.

M: Do you personally thing spreadsheets are risky?

Lady: Yes

Comment [MSOffice161]: SSs are risky.

Man: what you have said I would say yes but with personal experience I will say risk is 5%.

Comment [MSOffice162]: Yes after being made aware, but otherwise no.

Lady: because of the information that we are required to give other people that we are providing the information to everything we do is checked and checked and checked.

Man: It's always the bottom line figures that control the finance. That what I look at.

Comment [MSOffice163]: The key is bottom line figures.

M: I did come across the finance department risk register. Somehow, spreadsheets don't tend to feature on that at all. Do you think there should be some sort of standard for specially the strategic spreadsheets that are brought down for you to use and things like that?

Man: Yes, it's possible. If the spreadsheets all become corrupted and need to be rebuilt and maybe what impact that would be on loss of business to be carried on. That will be my view. It might take a week just to recreate the spreadsheets we need using the databases than may be that wont be a risk factor. The spreadsheets in my mind are always crossed checked with the finance system the bottom line figure is what matters. I may not be thinking outside the box.

Comment [MSOffice164]: SSs should be on risk register...but may be the ones used by higher management.

Lady: Yes

Lady 2: there is more to Martin's and Dave's spreadsheets which could possibly have more of an impact

M: model that we were tending to develop is basically has risk on one dimension and use on the other which comes under the categories operational, tactical and strategic. So most of the spreadsheets you come across would come into one of these categories anyways and probably the ones that you tend to use which category you think they would lie into. Would you think your spreadsheet will lie into strategic categories as well as?

Lady 1: some of them, because you got the govt dependant

Man: its mainly the outturn which nobody has got ownership of it. So the outturn would be something I sort of loss, or Lynn's loss. But the department loss on its corruption so if you are talking in terms of spreadsheets that we hold personally there is no risk at all.

Comment [MSOffice165]: Lower end SSs low risk.

M: so you will have situations where the spreadsheet that you are using is strategically important but not as risky.

Man: The outturn is very important. We all sort of can use it.

Lady: Martin's spreadsheet, the core salary that is on our share point so its held centrally anyways, but only certain people have got access to it. If we were to loose it, it could be recreated it would be inconvenient, very inconvenient but at its held now I assume is a secure site that shouldn't happen.

Comment [MSOffice166]: High end strategic ones have more controls so less risky.

M: What happens if you tomorrow you turn on your computer and the excel files and the spreadsheet models that you have created don't exists.

Lady: Oh Dear!!

Comment [MSOffice167]: Quote!!!

M: would it be a major problem or

Man: probably, it would.

Lady: it would.

w

M: if there is a spreadsheet which is handling a bigger amount, would you handle that more carefully as compared to something that handles a smaller amount?

Man: yeah, I think

Lady: it would be the complexity of the spreadsheet or whom you are reporting to will be the criteria.

Comment [MSOffice168]: Complexity and amount and whom you are reporting to can drive how you handle particular SS.

M: describe what kind of work each of you are involved in?

Karen: Me and Paul are on tuition fees, registration fees he might be able to explain better

Paul: We deal with all the tuition fees that come to the university and all registration fees. We deal with the collections; Karen mainly deals with the sponsor side, company sponsor students and Govt sponsors and things like that. I deal with self financing side and reporting side. That's basically our job is to analyse the tuition fee and collect them all. We have to produce reports, mainly through excel. We have two databases we got this student system CIMIS and we have got Agresso and because

Comment [MSOffice169]: Deal with tuition fees of students.

Comment [MSOffice170]: Rely on 2 systems CIMIS and Agresso.

there is no system in place that merges the two sets of information, we do it through excel. The sponsor ledger, the ADR is produced through Agresso where student login company and self financing students is produced thru excel on a spreadsheet because we have to merge data within Agresso with data within student system. That's basically what we do.

M: Are you involved with designing of spreadsheet yourself?

Paul: Yes

Karen: I use spreadsheets but only for my own use. For work but they never go, no one ever sees them.

Comment [MSOffice171]: SSs designed. Mainly for personal use only

M: What purposes do you use spreadsheets?

Paul: Backup, record keeping.

Comment [MSOffice172]: Used for back up and record keeping.

M: Its nothing analytical just for keeping records?

Karen: Yes

M: you end up designing for external or analytical purposes?

Paul: It's for auditors I have to produce reports to make sure that the report balances with the Agresso system. Student number will also balance the student system as well.

Comment [MSOffice173]: SS produced to produce reports to tally with Agresso.

M: When you design these models do you use any set methodologies?

Paul: No, its basically something I could do it myself. I use lookup tables I get the database from Agresso and the excel database from the student system and use look up tables to merge the information.

Comment [MSOffice174]: No methodology

M: Did you have any official training in excel?

Karen: Yes I have been on the Excel course. That was long back. Around 4-5 years ago.

Comment [MSOffice175]: Excel course few years back.

M: was it through work or on your own.

Karen: I used excel in uni and then I was on a short course here. It was a day or day and a half course.

Paul: I did a couple of days course. But mainly I have taught myself.

Comment [MSOffice176]: Mainly self taught

M: What level of confidence do you have in the spreadsheets that you tend to develop?

Paul: quite confident.

Comment [MSOffice177]: confident

M: Do you use any sort of tests or checks or anything like that?

Paul: My test and checks are to make sure I cross cast to the AGresso system. So as long as my spreadsheet is bound to the AGresso system is my check.

Comment [MSOffice178]: counter check with Agresso is only check.

M: As long as the amount that comes out of your spreadsheet balances with the system thats the only check you use.

Paul: Yes

M: The model that you develop do other people end up using it? Or is it just you?

Paul: no just me.

Comment [MSOffice179]: Self use only

M: You are the one who end up using it. Does anyone add information to it or anything?

Paul: I handle it completely myself. I will update it as and when new students come on to the system or payments are received things like that.

M: Has anyone else got access to it?

Paul: No, its on my hard drive and not on the shared drive.

Comment [MSOffice180]: Not shared.

M: What happens if anything goes wrong with your machine?

Paul: laughs..

Comment [MSOffice181]: Interesting!!

M: are your models/spreadsheets used in any decision making?

Paul: with the HDAT report it's just how we proceed with collection on each sort of category of student and its split into home student, sponsor student and overseas student and also accommodation debt will be listed on there. Its just the each level of debt how we proceed and that's on monthly basis. We go over the spreadsheet. Myself, Karen did well for John Hughes that's how we proceed for that month.

Comment [MSOffice182]: Decisions for debt collection.

M: basically are these decisions you make or are they collective?

Paul: Collective

M: So its collective based on system that you end up designing and whatever information is fed and its based on that. To what extent are you confident with the information that is on the spreadsheet that you tent to have.

Paul: We have to be confident it balances.

M: there might be a situation that a student has paid and it hasn't gone onto the system. The total of debt and recovered will still be the same but breakup of that total might vary.

Paul: The only thing we find anomalies where is the source data when the enrolment information we find sometimes incorrect enrolment information goes into it so that has a knock on effect for us. With regard to balance and payments the only <> is bank reconciliation if the payment is missing because we have so many transactions going through the bank but we got bank <> that all goes on and then cross <> with Agresso to make sure our system is updated.

M: The model that you develop except the cross checks the basic end balance and Agresso balance tallying do you use any other test?

Paul: yes, I do lookup tables again. I get balance of each customer and put them in different spreadsheet. I will do a spreadsheet total and work on each data report on the spreadsheet on customer. I will do the same within Agresso to make sure each customer is correct as well.

Comment [MSOffice183]: Look up tables used for testing.

M: Do you do any tests?

Karen: No mines are very basic

M: What does your spreadsheet do then?

Karen: I deal with sponsors so I have just got the spreadsheet to all the sponsor debt outstanding and I just make mine notes against each sponsor. So it's just a very basic one. It's just for my records.

Comment [MSOffice184]: Basic notes for sponsors.

M: Do you deal with the sponsors directly or you just feed information to people up?

Karen: No, I deal with sponsors.

M: oh so you deal with sponsors directly based on the information whatever you have on them. Have you had any instances of any anomalies that your sponsor has turned around and say oh no I don't owe that much or something like that?

Karen: Yes, but that's only because the perhaps the payment has gone on the statement and we haven't been informed or something like that. Its not something that been missed off the spreadsheet because mainly I use Agresso and I just use spreadsheet for my own notes.

Comment [MSOffice185]: Anomalies mainly due to communication and not SSs.

M: How about you do you come across a lot of discrepancies?

Paul: Yes, we can get them especially I report on the accommodation and bursary side I don't actually put the payments or adjustments on them. So I don't update the spreadsheet. If a payment goes thru for a tuition fees or bill comes on I update the spreadsheet but with the accommodation I don't. So I only pick that up that at the month end when I do the report from Agresso.

Comment [MSOffice186]: Some anomalies do occur in Accommodation fees.

M: Accomodation people send you the information then?

Paul: Not to me they send it to Sheila or Andrews in next. Sheila deals with them send them the bills and input the information for accommodation and I only filter that on my spreadsheet.

M: so she is the one who sends information to you?

Paul: No, she sends it to Agresso system and I get it from there.

Comment [MSOffice187]: Info fed into agresso by someone else and picked up by respondent.

M: Do you have any compliance system or are these spreadsheets that you tend to develop or the information that you hold on spreadsheet audited?

Paul: Yes, the come in to audit. They do the basic audit year end audits and they take a snap shot to make sure that everything on there is ok and we stick them on spreadsheet we are doing but that's about it really. Its only the year end figures they look at.

Comment [MSOffice188]: Only year end figures are audited.

M: They don't try to investigate where those figures came from and things like that?

Paul: Only the year end figures. So far.

M: Have you heard about Sarbanes Oxley?

Karen: No

Paul: No

M: Its mainly for the compliance regulation mainly in the US or companies dealing with US companies but we have got equivalent compliance regulations. All the information that you hold about someone should be auditable and should be right and things like that and can be questioned at times. You don't have any typical compliance procedures.

Paul: No

Karen: No

Comment [MSOffice189]: No compliance.

M: It's the decision on the prepayments and things like that, that's the kind of decision you use it for. The model that you end up developing do you have any documentation related to the model that this is what it does, this how it does, and things like that?

Paul: No

Karen: no

Comment [MSOffice190]: No documentation.

M: Does anyone ask you as to how do you come to this figure or that figure and things like that?

Paul: They ask me when I first produced the model but that was it then.

Comment [MSOffice191]: Check only when first time model produced.

M: When was this?

Paul: 6-7 years ago.

M: Have you modified the model through time?

Paul: Yes, each year a better one to report and better way to categorize things within that but we are just talking about the ADR we do different things with the spreadsheets. We use spreadsheets for mail merge basis and we do it for reporting to the Student Loans Company and things like that. They all go along the same basis it's the merging of records from two systems into one spreadsheet that we use. We use it for debt reports; we use it for sending letters to students, for giving information to student loan companies.

Comment [MSOffice192]: SS used for merging data from two systems. Generate debt reports.

M: Do you have any version control?

Paul: I have them all within folders within my file and I date them. I use the month end date really and so the one I working on will currently will be dated of May and then I will go to June.

M: Would you have any idea of what modifications you make to that model last year?

Paul: No, it's hard really.

M: would you know what changes you have done to it?

Paul: Yes, I could always go back to the source information in Agresso where exactly

Themes Analysis

1. No compliance procedure for SS. (General Observation)
2. Forecasting (Financial)
3. generate financial management reports (Financial)
4. to load information into Agresso (Operational)
5. To manipulate information from Agresso. (Financial)
6. Unsure if it should be on Risk Register (general Observation)
7. Management accounting department (Financial)
8. Budgeting and reporting. (Financial)
9. Applications for grants (Information)
10. Risk management is done for each project. (General Observation)
11. SS regularly used. (General Observation)
12. Developed and acquired from others. (General Observation)
13. Used for business planning (Operational)
14. Budgetary controls. (Financial)
15. Monitor effective utilisation of funds. (Financial)
16. Monitor effective utilisation of resources. (Operational)
17. Financial risk management for undertaking certain activities, projects. (Financial)
18. Control and capturing data for stakeholders. (Information)
19. Most SSs self created. (General Observation)
20. System template used to create designs.(General Observation)
21. To interrogate existing financial system. (Financial)
22. SS have access to the database. (General Observation)
23. To check if tools are correct in the system. (Operational)
24. SS feed into the main system. (General Observation)
25. Little or no documentation (General Observation)
26. Used by others. (General Observation)
27. Training on database but SS is more on experience. (General Observation)
28. No methodology. (General Observation)
29. Occasionally errors spotted. (General Observation)
30. Cross calculations on system and SS (Financial)
31. SS are parallel systems. (General Observation)
32. Agreed that SS are risky (General Observation)
33. Errors could run risks (General Observation)
34. Can effect decision making or investment. (General Observation)
35. Need to monitor closely for changes or alterations. (Information)
36. No Compliance. (General Observation)
37. All info is backed up.(Information)
38. Some level of version control. (General Observation)
39. Some SSs have protection. (General Observation)
40. Protection based on whom it is shared with. (General Observation)
41. Clear information (General Observation)
42. Timely (Observation: Says why SS are useful)
43. Future trends. (Information)
44. Accurate information. (General Observation)
45. Easy to use and clarity. (Observation: but for why SS are useful.)
46. Simplifies info extraction. (Observation: but for why SS are useful)
47. Database good as reporting tools. SS good for consolidating info and easier to use.
(Information: And Observation: why SS are used)
48. SS should feature on the Risk Register. (General Observation)
49. Formal approach needed to SS. (General Observation)
50. Wrong info can impact decisions. (General Observation)
51. Enterprise finance manager. (General Observation)
52. Low risk job. (General Observation)
53. Need for risk management still high (General Observation)
54. Risk is not just financial risk. Operational risks are thre too. (General Observation)

55. SSs massively used. (General Observation)
56. Basic to advanced for forecasting and planning. (Information)
57. SS developer. (General Observation)
58. Some training for basics (General Observation)
59. Advanced self taught (General Observation)
60. Made mistakes (General Observation)
61. Idiot checks are useful (General Observation)
62. Should not rely blindly on numbers. (General Observation)
63. There are different levels of SSs. (General Observation)
64. Information capturing SS. (General Observation)
65. Information capturing SS low on risk. (General Observation)
66. Quick rough add-up is enough. (General Observation: but highlights the main advantage of SSs)
67. Management reporting SSs. (General Observation)
68. Reconfirmation of figures with Aggresso as a check. (General Observation)
69. Aggresso is the bottom line system. (General Observation)
70. If fugures don't tally with aggresso then there is problem. (General Observation)
71. Other independent forecasting SSs cannot have same check. (General Observation)
72. Business Plan SSs. (Information)
73. Strategic SSs. (Information)
74. Only big difference can be spotted. (What about small amounts???) ((General Observation: But helps set the criteria for impact)
75. Just basic figure tallying with Aggresso as testing. (General Observation)
76. No documentation (General Observation)
77. Some version control. (General Observation)
78. Some SSs shared. (General Observation)
79. Some protection when sharing. (General Observation)
80. SSs within department not protected. (General Observation)
81. High on scale for SS use. (General Observation)
82. Major time spent on SSs. (General Observation)
83. Management reporting. (Information)
84. Forecasting (Information)
85. Decision making. (Information)
86. Purchasing for projects. (Financial)
87. Used for profitability assessment. (Financial)
88. SSs are risky if in wrong hands. (General Observation)
89. SS are quick (General Observation: But adds to the Urgency element)
90. Speed up processes ((General Observation: But adds to the Urgency)
91. Quick and accurate. (General Observation: But adds to the Urgency)
92. I will hate to lose the SSs. ((General Observation)
93. Hear of SOX (General Observation)
94. No Compliance. (General Observation)
95. Speed to manipulate and present information. (General Observation but adds to urgency)
96. Even if I have more time I will use SSs. (General Observation)
97. SSs can do book-keeping. (Financial)
98. Nothing catastrophic. (General Observation)
99. Error worth couple of grand. (General Observation)
- 100.Quote!!!**
- 101.High errors are more likely to be noticed. (General Observation: But adds to the impact)
- 102.SS with bigger amount will be held more carefully. ((General Observation: But related to Impact)
- 103.Looks after Aggresso and the finance system. (General Observation)
- 104.Not involved in any risk assessment. (General Observation)
- 105.All management reports are through Excel. (General Observation)
- 106.SS developer. (General Observation)
- 107.Been on some Excel courses. (General Observation)
- 108.Seek help from Husband. (General Observation)
- 109.No methodologies. (General Observation)

110. Some documentation. (General Observation)
111. Reporting. (Information)
112. Check the bottom line figures with Agresso. (General Observation)
113. Not involved in decision making but pass on information for the same. (Information)
114. No major catastrophes witnessed. (General Observation)
115. Part of the job is with SSs. (General Observation)
116. No compliance. (General Observation)
117. Never thought SSs are risky. (General Observation)
- 118. Quote????**
119. Was unaware that there are risks with SSs. (General Observation: Confirms lack of awareness)
120. The key check is to look at the bottom figure and tally with Agresso. (General Observation)
121. Check with Agresso. (General Observation)
122. Just financial reporting use. (Financial)
123. Analysing salary budget figures. (Financial)
124. SS developed by someone else. (General Observation)
125. Develop next financial year's budget on course salary. (Operational)
126. Running management reports. (Information)
127. Management reports for head of departments. (Information)
128. Budget managed by others, we only give figures. (Information)
129. Load, unload and amend SSs from others. (General Observation)
130. Design low key SSs. (General Observation)
131. Non developer, just user. (General Observation)
132. Just basic SS design. (General Observation)
133. Spreadsheets created using Agresso (General Observation)
134. Just feeding information from SSs to management. (Information)
135. Salary based decisions. (Information)
136. Overtime budget decisions. (Financial)
137. Extract info from Agresso, format it and feed to management for decisions. (Information)
138. Some inhouse training. (General Observation)
139. No training. (General Observation)
140. SSs shared and can be used by others having access to the same drive. (General Observation)
141. Protection only if shared outside the department. (General Observation)
142. Password protected. (General Observation)
143. Basic info like who owes advances. (Trivial)
144. Agresso does not give in the format that is needed. (Information)
145. SS used to have info in the format that is needed. (General Observation)
146. To record information from external sources. (Information)
147. High confidence as basic SSs. (General Observation)
148. There is scope for human error. (General Observation)
149. Errors do occur until you check it. (General Observation)
150. Gut feeling matters. (General Observation)
151. Gut feeling testing applied. (General Observation)
152. The impact could be large. (General Observation: Talks about impact though)
153. Usually occurs when getting figures from another sheet. (General Observation)
154. General figure value is the only check. (General Observation)
155. No audits no compliance. (General Observation)
156. Convenient. (General Observation: But highlighting why SSs)
157. Easy to use (General Observation: But highlighting why SSs)
158. Calculations on clicks. (Trivial)
159. Easy and quick (General Observation: But highlights why SSs used)
160. Even if more time is available, still will use SSs. (General Observation)
161. SSs are risky. (General Observation)
162. Yes after being made aware, but otherwise no. (General Observation)
163. The key is bottom line figures. (General Observation)
164. SSs should be on risk register...but may be the ones used by higher management. (General Observation)
165. Lower end SSs low risk. (General Observation)
166. High end strategic ones have more controls so less risky. (General Observation)

167.Quote!!!

168.Complexity and amount and whom you are reporting to can drive how you handle particular SS. (General Observation: But also talking about Impact and Likelihood)

169.Deal with tuition fees of students. (Operational)

170.Rely on 2 systems CIMIS and Agresso. (General Observation)

171.SSs designed. Mainly for personal use only (Trivial)

172.Used for back up and record keeping. (Operational)

173.SS produced to produce reports to tally with Agresso. (General Observation)

174.No methodology (General Observation)

175.Excel course few years back. (General Observation)

176.Mainly self taught (General Observation)

177.confident(General Observation)

178.counter check with Agresso is only check. (General Observation)

179.Self use only(Trivial)

180.Not shared. (General Observation)

181.Interesting!!! (General Observation)

182.Decisions for debt collection. (Information)

183.Look up tables used for testing. (General Observation)

184.Basic notes for sponsors. (Trivial)

185.Anomalies mainly due to communication and not SSs. (General Observation)

186.Some anomalies do occur in Accommodation fees. (General Observation)

187.Info fed into agresso by someone else and picked up by respondent. (General Observation)

188.Only year end figures are audited. (General Observation)

189.No compliance. (General Observation)

190.No documentation. (General Observation)

191.Check only when first time model produced. (General Observation)

192.SS used for merging data from two systems. Generate debt reports. (Operational)

Appendix 6

EUSpRIG Online Forum Discussion

Stephen Allen: February 2010 2:29 p.m.

Erich

I like the music analogy, but I don't agree the logic. I suggest a change as follows

"We can push the musical analogy further here. Classical spreadsheets (like Excel) are stringed instruments (violin, viola, cello etc), multidimensional spreadsheets (like Quantrix) are keyboard instruments. If you have to play chords (meaning multidimensional models), you will need extensive practice to get then to sound right on a stringed instrument (e.g. J S Bach solo violin sonatas and partitas). Additionally, you are limited to a maximum of 4 note chords with certain limitations on the spread of individual intervals. This analogy fairly closely imitates the limitations within Excel.

Comment [MSOffice1]: Spreadsheets have limitations for very complex models.

Unfortunately, I'm not familiar with Quantrix and cannot comment on an equivalent musical analogy (e.g. Bach Preludes and Fugues for keyboard)."

Stephen Allen

Mark Simms: February 2010 11:03 a.m.

Management often just assume that people can "do" Excel. When was the last time anyone actually got tested on their Excel skills as part of a job interview process? In every interview I've ever had the question has been "What are you like on Excel? Can you do VBA?". My answer has invariably been "Yes, I'm really strong in this area.", and then we move swiftly on to the next question .

Exactly. Time to take the whole HR/employment process with a HUGE "grain of salt".

I've recently been extended as an Excel "temp" at this Fortune 50 company because the manager who was supposed to be "Top Gun Excel Expert" has been learning so much from me....

Suddenly, she looks like a "regular user".

Imagine those at this company of a lower expertise..... dangerous-at-best !

Comment [MSOffice2]: Top management dependent on people with lower expertise.

David Colver: February 2010 4:58 a.m.

Eric Neuwirth wrote on 16/02/2010 06:28:47:

- > Assuming you can model complex dependencies without any errors without
- > any further training just because you are smart essentially is
- > equivalent that you can play Beethoven's piano sonatas just after having
- > listened at a recording.

People greatly overestimate **their** ability to do modelling well. And even if they don't, they are often very price sensitive and pay little heed to the competence of the consultant they are hiring.

Comment [MSOffice3]: People overestimate ability to model spreadsheets

It's funny though that that never happens when people are in need of brain surgery. There isn't much of a market for economy brain surgery, still less for the amateur kind.

I've long wondered where these differences in attitudes stem from.

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Patrick O'Beirne: February 2010, 9:53 a.m.

A pun on "root cause analysis"

[://www.professionaltester.com/](http://www.professionaltester.com/)

Magazine Issue 1 is out!. Its theme is Very early lifecycle testing.

[://www.professionaltester.com/files/PT-issue1](http://www.professionaltester.com/files/PT-issue1).

Quote:

>>

Seeking the truth behind legendary failures

Everyone in testing has heard, and many have retold, stories of software product and/or project disasters. They are bandied about particularly often in training situations, when course presenters use them to explain their points, or sometimes just to reinforce the importance of being aware of the risks of unexpected failure.

Rude Coarse Analysis is where you can help Professional Tester put a stop to that and discover the real truth. To get the ball rolling, here are three old stories we, and probably many of you, have heard in the last few years

<<

We might need some of that rude coarse analysis too :-)

P.

--

Martin Griffin: February 2010, 5:43 p.m.

Spreadsheets are like a knife in the wrong hands, they can have devastating consequences especially juveniles and those with handling inexperience. One approach that could be adopted to assess potential employees Excel proficiency is to use adopt the methodology described by Irons (2008) and Panko and Sprague (1998) with The Wall and The Ball. This is not an acceptable industry-standard multiple choice written tests but assessment of based on the construction of two spreadsheet models.

Comment [MSOffice4]: Spreadsheets are like knife in wrong hands.

Comment [MSOffice5]: Methodology should be adopted to develop spreadsheets

Irons, R. J. 2008. The Wall and The Ball: A Study of Domain Referent Spreadsheet Errors.

Panko, R. R. and Sprague, R.H.J. 1998. Hitting the Wall: Errors in Developing and Code-Inspecting a "Simple" Spreadsheet Model. Decision Support Systems, 22, 4, 337-353.

Visit our web site at www.scottwilson.com

[@tempranacapital.](#): February 2010, 2:04 p.m.

As a contributor whose only experience to date has been with middle management as opposed to high-level consulting with senior managers, I can only comment on the working practices I have seen and experienced at the lower end of the spectrum. Unfortunately, this is where many of the errors do occur and do not get picked up by managers at the beginning of the workflow cycle.

Two killer comments by ScarletChaplin and George Brennan were, for me, the highlights of this thread:-

1. "The problems arise because the people building the models are not trained in doing so..." (GB)
2. "From my experience the amount of time put into the development of a particular spreadsheet is often a function of how much pressure the creator is under to get the job done." (SC)

Management often just assume that people can "do" Excel. When was the last time anyone actually got tested on their Excel skills as part of a job interview process? In every interview I've ever had the question has been "What are you like on Excel? Can you do VBA?". My answer has invariably been "Yes, I'm really strong in this area.", and then we move swiftly on to the next question.

Comment [MSOffice6]: Management assume people can do excel.

Everyone just assumes lower-skilled (and lower-paid) employees can do Excel and these skills never really get checked at the interview stage.

Comment [MSOffice7]: Excel skills never checked.

One possible solution would be to create a series of acceptable industry-standard multiple choice written tests which vary in difficulty that interviewees would need to complete.

This would be a quick and sure-fire way to weed out the bluffers from the people who really know their stuff.

Comment [MSOffice8]: Spreadsheet skills need to be tested.

Does this exist? If it does, then I've never heard about it....and this is someone talking from the lower end of the spectrum.

Secondly, as ScarletChaplin points out, time pressure is probably (IMOH) where most mistakes occur. I don't have any ideas to answer this one so I suggest this is where the real thinking needs to be directed as regards a Silver Bullet for Excel....if one exists??

Comment [MSOffice9]: Supports Scarlet Chaplin: Time pressure causes error

The problems arise because the people building the models are not trained in doing so, there is a lack of due process in defining requirements, challenging assumptions then in creating, validating and testing then documenting a model. Finally locking it down and auditing changes.

Comment [MSOffice10]: People developing models not trained: so lack of due process

Erich Neuwirth: February 2010, 12:29 p.m.

Even if many people do not think so, designing spreadsheets IS programming. It is somewhat easier than in traditional programming languages mainly because you can see the data and the symbolic formulas at the same time. Therefore you get immediate feedback about your symbolic operations as they are applied to your data.

Comment [MSOffice11]: Designing spreadsheets is programming

That's different from classical programming, at least when using imperative languages. You can do a more similar approach in functional programming languages.

Since designing spreadsheets is programming and/or modeling after all, people who lack modeling abilities will in general produce bad spreadsheets.

Comment [MSOffice12]: People with lack of modelling abilities will produce bad spreadsheets

If you give people pianos, not all of them will become new Horowitzes. Spreadsheets are like pianos. You can play simple melodies with one finger relatively easily, but you should not assume that you can play Beethoven's piano sonatas without extensive training including learning from the masters.

Comment [MSOffice13]: Spreadsheet and piano analogy....USEFUL to quote????

Comment [MSOffice14]: Training needed to develop complex spreadsheets

Assuming you can model complex dependencies without any errors without any further training just because you are smart essentially is equivalent that you can play Beethoven's piano sonatas just after having listened at a recording.

And if your model is inherently multidimensional, you should use a multidimensional spreadsheet like, say, Quantrix.

We can push the musical analogy further here. Classical spreadsheets (like Excel) are wind instruments, multidimensional spreadsheets (like Quantrix) are keyboard instruments. IF you have to play chords (meaning multidimensional models), you will not be able to do this in any reasonable way on a wind instrument.

Adrian Miric: February 2010, 12:10 p.m.

I have mentioned this problem before but for the first time I am seeing serious impacts on decisions and perhaps this is one case where it is not really related to human error.

Comment [MSOffice15]: Errors in spreadsheets having big impact.

I have created a warning video clip for my clients which shows how it has happened at one client where the projected dividend was R200 million (\$27 million) more than anticipated (in this case positive but I am sure there are negative impacts). You can see what happens at <http://www.auditexcel.co.za/NA-Error-Excel-2003-to-Excel-2007>.

Comment [MSOffice16]: Spreadsheet error cost \$27 million.

I have (and various other people) have tried to understand the problem and find a solution but there seems to be none except save it in 2007 format only, which is not always practical especially for consultants handling many different clients on many versions of Excel.

Does anyone have a definitive fix or perhaps Microsoft can address the issue directly? I have previously spoken to Microsoft but as I can't provide a spreadsheet that will experience the same problem every time, they can't seem to analysis it.

Regards

Adrian Miric

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Next Advanced Excel Training Courses (visit www.AuditExcel.co.za/livetraining.html for more):

Ralph Baxter: February 2010, 9:26 a.m.

A few points:

1. All these risks are very real ...some of the largest companies in the world have made mis-statements of billions of dollars in very recent years simply on the back of spreadsheets being used as part of financial reporting. They also own the largest accounting systems....but there is always a need for just a few extra spreadsheets to handle the last items that live outside the system. Of course the systems catch up and those spreadsheets can be retired but then the world moves on and more spreadsheets appear.

Comment [MSOffice17]: Spreadsheet errors cost a lot

Comment [MSOffice18]: Spreadsheet s used for financial reporting

Comment [MSOffice19]: Spreadsheet s complement accounting systems

Comment [MSOffice20]: Spreadsheet s here to stay

2. It is fair to say that a number of software vendors (including ourselves) have gone a long way to solving these problems. We think we are by far the best (of course!) but put us side-by-side with any other approach and we will discover spreadsheet activity and content that make people turn white. There are, for example, some amazing things that you can do with conditional formatting.

Comment [MSOffice21]: Software vendors trying to help. Technical solutions.

3. Since organizations (and their individual departments) are different so too are their best practices. Some want to make integrity part of user behaviour. Others want it to be remotely monitored. These are essentially different flavours of the same requirement. I can happily provide documents describing the best practices that are now in use in many global firms.... but be careful what you wish for!

Comment [MSOffice22]: Spreadsheet best practice can be different for different firms.

4. All the main auditors and business transformation consultants have growing expertise in this area. In terms of published material I would strongly encourage you to look at Philip Howard's research at the IT analyst Bloor. He published one (free) set of guidance on spreadsheet governance at the end of last year. He has another paper on a spreadsheet management maturity model which is due out imminently and then he has another paper on individual software solutions appearing shortly. In addition Protiviti have published an excellent FAQs paper in this area.

Comment [MSOffice23]: Research in spreadsheet risk – Governance, software solutions.

Hope this helps

Ralph Baxter

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Scarlet Chaplin: February 2010, 7:17 p.m.

> So let's stop running down the the good old spreadsheet and instead devise tools and practices to lower error rates!

This was the main reason for starting the thread in the first place. We all recognise that the spreadsheet is here to stay and that it is a very powerful tool. But with the power comes the risk. The more you can do in a spreadsheet the more chance there is for things to go wrong.

Hence my interest was to find out if anyone has tried to make a list of some of the most risky elements and to further see if anyone has gone on to try and quantify those risks in terms of "most risky" to "not so risky".

In order to lower the error rates we have to know where to focus the most attention in this management process. One suggestion was that the way to manage the risk is to have a more formalised process around the development of spreadsheets that includes analysis, documentation, testing, validation and access control. All these are likely to help to develop spreadsheets that are less risky and more easily maintained but some of these procedures will have an impact on the time it takes to create the spreadsheet and for some people that will be unacceptable and they will simply ignore the more formalised framework and go back to their old ways. (Knock it up and use it!)

From my experience the amount of time put into the development of a particular spreadsheet is often a function of how much pressure the creator is under to get the job done. This leads to a dichotomy. Things like documentation get left to the end and are often not done, if they were even considered in the first place.

So is it more productive to focus on managing the spreadsheet risk from "above" by having IT or some other oversight group do the cataloguing, testing and validating of the sheets that are being used and providing them with tools to help check things like broken links and other risky elements of the spreadsheet itself. Access control and having the ability to re-engineer a spreadsheet back to a point in time when it had been validated would also seem to be very important.

Comment [MSOffice24]: Spreadsheets are here to stay!

Comment [MSOffice25]: Spreadsheets are powerful.

Comment [MSOffice26]: More the power more the risk and chances to go wrong

Comment [MSOffice27]: Study of Risk management of spreadsheets needed

Comment [MSOffice28]: Risk management of spreadsheets needs to be formalised.

Comment [MSOffice29]: Too much control might not be a good option.

Comment [MSOffice30]: Spreadsheet dichotomy – work pressure Vs documentation

Comment [MSOffice31]: Spreadsheet risk management needs to start from top

Comment [MSOffice32]: Someone needs to overlook the controls – possibly IT department

Mark Simms: 15 February 2010, 11:02 PM

I work with a fortune 50 company who depends on spreadsheets for their very survival.

Comment [MSOffice33]: Spreadsheets are critical for survival

Comment [MSOffice34]: Quote?????

Here are the major problems:

1) lack of a publication called "best spreadsheet practices"

- there are usually 3-4 ways of doing something...with only 1 or 2 being acceptable practices
- thus, a 50-50 chance of using a poor practice

Comment [MSOffice35]: There is no best practice for spreadsheets

2) poor or missing documentation. Every workbook should have a "docs" worksheet

- dependencies especially need to be documented

Comment [MSOffice36]: Poor or No documentation

3) VBA paranoia

- IT departments actually ban it's use
- forces users into super-complex nested formulas
- reliability and maintainability actually declines

Comment [MSOffice37]: IT departments avoid using spreadsheets.

Well written and well documented VBA procs and forms just runs rings around cludgy, formula-based approaches.

Also, they are much more reliable...no typing errors, no chance for user error.

Comment [MSOffice38]: VBA codes might be a solution.

Richard Petti: February 2010, 7:10 a.m.

Ray,

I agree that anyone who talks about eliminating spreadsheets on the scale of a lifetime or two is smoking dope – unless of course some unforeseen innovation we don't have today replaces them.

Comment [MSOffice39]: Getting rid of spreadsheets impossible

Spreadsheets, along with word processors, led the desktop revolution, which enabled domain experts to self-serve while slashing dependence on programming specialists. They accomplish this by enable authors to understand their models primarily through visual layout based on a simple cell paradigm, instead of pages of code. The deep innovation is in authoring – output reports "always" used visual layout as the primary way for report users to find their way around.

Comment [MSOffice40]: Spreadsheet s reduced dependence on programming specialists.

Comment [MSOffice41]: Spreadsheet s are innovative.

However, I don't think it is accurate to deny that the spreadsheet paradigm has significant limitations. Spreadsheets have been so wildly successful that they are now being applied to complex applications that stretch their design concepts to the limit. The flipside of their brilliant design is that spreadsheets do not have (or have

Comment [MSOffice42]: Spreadsheet s widely used.

Comment [MSOffice43]: Spreadsheet s used in complex designs.

weak versions of) model structures such as named variables, segmentation dimensions, time series, variable data types that (direct automated computational processes), symbolic formulas with varying and overlapping scopes. The result is that spreadsheets compel authors to think and act at the level of cells, rather than at the conceptual level. The good news is that, unlike most programming languages, spreadsheets do not compel authors to **focus** on the conventions of a confining syntax.

Comment [MSOffice44]: Spreadsheets not confined by syntax

Innovation in spreadsheets suffers from the standardization that great success made necessary. Therefore it is extremely difficult for design innovators to implement and gain adoption for changes to the paradigm. Since 1993 when Excel introduced pivot tables and multiple worksheets, the innovations have enhanced the **existing** spreadsheet paradigm with more functions, better graphics, bigger models, faster interactive and computational performance, better user interfaces for authors and report users; and better VBA and then .NET. That is, there has been little fundamental innovation in the spreadsheet authoring paradigm, except to supplement it by adding programming languages on top.

Comment [MSOffice45]: Spreadsheets are innovative

In my humble opinion, spreadsheets are not the best way to formulas many analysis problems, though they often provide a better way to implement **computations** than getting buried in programming conventions. I base my conclusions on comparing spreadsheets with what I have learned from research-level experience in pure mathematics, general relativity, engineering physics, and business analytics.

Comment [MSOffice46]: Spreadsheets provide better ways to implement computations than programming languages.

The question is what to do about the problems.

--Dick Petti

Ray Panko: February 2010, 2:31 a.m.

The suggestion to get rid of **spreadsheets** comes up frequently. There's just no evidence behind the suggestion. If you look at the research, you see that spreadsheet **error** rates are almost exactly the same as error rates in third generation programming languages (3GPLs), in both development and inspection. The same is true of errors in other reasonably complex human cognitive domains.

Comment [MSOffice47]: No evidence behind suggesting to getting rid of Spreadsheets.

Comment [MSOffice48]: Spreadsheet error rates same as 3G programming languages.

Compared to 3GPLs, in fact, **spreadsheets** are better to use. While error rates are similar, it usually takes many more 3G programming statements to do something than it takes spreadsheet cell formulas. So the final error rate is likely to be substantially harder.

Comment [MSOffice49]: Spreadsheets are better to use than 3GPL

Of course, if you have a dedicated piece of software to do a task, such as a financial reporting package, there will be fewer tasks to do, so errors introduced during use should be much lower. Unfortunately, as we learned during the gearing up for Sarbanes-Oxley, even companies that use Hyperion or a similar dedicated program often do the trickiest aspects of their work, such as end-of-period adjustments, on spreadsheets.

Comment [MSOffice50]: Spreadsheets still used for trickiest aspects of works such as end of period adjustments.

The question should be, "What dev tool is best for this particular job?" This is not an easy question to answer. Frankly, except in special cases, I can't see 3G programming languages winning too often, and even if a packaged program is used, learning to use it and doing ancillary calculations needs to be considered very carefully. In addition, in every situation I've worked in, available packaged programs did *almost* what the company wanted but that doing the rest of what was needed proved to be very difficult and expensive. And, as we all know, packaged software is never error free.

Comment [MSOffice51]: Spreadsheets complement what standard off the shelf solutions don't quite achieve

Comment [MSOffice52]: Legitimacy of spreadsheets

Comment [MSOffice53]: Off the shelf programmes are not error free

Ray

Computers are responsible for more errors than anything else--with the possible exception of hand guns and Tequila.

Comment [MSOffice54]: Quote????

@tempranacapital.: February 2010, 6:49 p.m.

Great comment. Trying to stop people using spreadsheets is never going to work. Nothing else can deliver the flexibility, user-friendliness and gentle learning curve that Excel does.

Comment [MSOffice55]: King Canute

Comment [MSOffice56]: Flexibility, user-friendliness, gentle learning curve

The old adage of bad workmen blaming their tools is as true as ever in this case. So let's stop running down the the good old spreadsheet and instead devise tools and practices to lower error rates!

Comment [MSOffice57]: Need for monitoring/control

Andy Wiggins: February 2010, 12:09 p.m.

> Using spreadsheets in the first place!

This is a bit off the topic but if you stopped people from using spreadsheets in the

first place, you would most likely stop a lot of people from having a tool to innovate and improve their productivity. In some businesses you would also run the risk of losing the competitive edge of "timing" (first to market) if every bit of number crunching had to be developed under the auspices of the IT dept framework. Properly monitored a spreadsheet is a very powerful way to empower individuals to be creative. I believe its then up to management to "manage" the risk that the spreadsheet presents IF it is subsequently used in any way that can add to the risk profile of the entity concerned.

Comment [MSOffice58]: Spreadsheets contributing to competitive advantage

Comment [MSOffice59]: Spreadsheets allowing you to be creative & innovative

Comment [MSOffice60]: Spreadsheets more timely

Comment [MSOffice61]: Need for management to manage risks

Themes Analysis

1. Spreadsheets have limitations for very complex models. (Spreadsheets have limitations)
2. Top management dependent on people with lower expertise. (Low expertise; high responsibility)
3. People overestimate ability to model spreadsheets (Espoused theory)
4. Spreadsheets are like knife in wrong hands. (Spreadsheets are risky)
5. Methodology should be adopted to develop spreadsheets (Need of standardisation)
6. Management assume people can do excel. (Low expertise high responsibility)
7. Excel skills never checked. (Test the Skills))
8. Spreadsheet skills need to be tested. (Test the skills)
9. Supports Scarlet Chaplin: Time pressure causes error (Urgency leads to errors)
10. People developing models not trained: so lack of due process (Low expertise high responsibility) (Need for Standardisation)
11. Designing spreadsheets is programming
12. People with lack of modelling abilities will produce bad spreadsheets (Low expertise High Expectations)
13. Training needed to develop complex spreadsheets (Need for training)
14. Errors in spreadsheets having big impact. (Spreadsheets are risky)
15. Spreadsheet error cost \$27 million. (Spreadsheets are risky)
16. Spreadsheet errors cost a lot (Spreadsheets are risky)
17. Spreadsheets used for financial reporting (Spreadsheets used for financial reporting)
18. Spreadsheets complement accounting systems (Spreadsheets are complementary)

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19. Spreadsheets here to stay
 20. Software vendors trying to help. Technical solutions. (Technical Solutions being worked on)
 21. Spreadsheet best practice can be different for different firms. (Need of Standardisation)
 22. Research in spreadsheet risk – Governance, software solutions. (Research in Spreadsheets risk needed)
 23. Spreadsheets are here to stay! (Spreadsheets are here to stay)
 24. Spreadsheets are powerful.
 25. More the power more the risk and chances to go wrong (Spreadsheets are prone to risks)
 26. Study of Risk management of spreadsheets needed (Research in Spreadsheets Risk Management needed)
 27. Risk management of spreadsheets needs to be formalised. (Risk management of Spreadsheets needed)
 28. Too much control might not be a good option. (Too much control is not right)
 29. Spreadsheet dichotomy – work pressure Vs documentation (Work pressure leads to Lack of Documentation)
 30. Spreadsheet risk management needs to start from top (Top management should be involved in SS Risk Management)
 31. Someone needs to overlook the controls – possibly IT department (Some control needed)
 32. Spreadsheets are critical for survival (Spreadsheets are here to stay)
 33. There is no best practice for spreadsheets (No Standardisation)
 34. Poor or No documentation (Lack of documentation)
 35. IT departments avoid using spreadsheets.
 36. VBA codes might be a solution. (Technical solutions developed)
 37. Getting rid of spreadsheets impossible (Spreadsheets are here to stay)
 38. Spreadsheets reduced dependence on programming specialists. (Spreadsheets reduce dependence on programmers)
 39. Spreadsheets are innovative.
 40. Spreadsheets widely used. (Spreadsheets are here to stay)
 41. Spreadsheets used in complex designs. (Spreadsheets used for complex problems)
 42. Spreadsheets not confined by syntax (Ignore!)
 43. Spreadsheets are innovative (Spreadsheets are innovative)
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44. Spreadsheets provide better ways to implement computations than programming languages. (Spreadsheets more useful than programming)
 45. No evidence behind suggesting to getting rid of Spreadsheets. (Spreadsheets are here to stay)
 46. Spreadsheet error rates same as 3G programming languages. (Error rates same as other disciplines and tools)
 47. Spreadsheets are better to use than 3GPL (Spreadsheets more useful than programming)
 48. Spreadsheets still used for trickiest aspects of works such as end of period adjustments. (Spreadsheets used even for complex problems)
 49. Spreadsheets complement what standard off the shelf solutions don't quite achieve (Spreadsheets are complementary)
 50. Legitimacy of spreadsheets (Ignore!)
 51. Off the shelf programmes are not error free (Errors are there is off the shelf programmes)
 52. King Canute (Spreadsheets are here to stay.
 53. Flexibility, user-friendliness, gentle learning curve (Spreadsheets are flexible)
 54. Need for monitoring/control (Some control needed)
 55. Spreadsheets contributing to competitive advantage (Spreadsheets are critical)
 56. Spreadsheets allowing you to be creative & innovative (Spreadsheets enhance creativity)
 57. Spreadsheets more timely (Spreadsheets are timely)
 58. Need for management to manage risks (Spreadsheet risk management needs to be developed.
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1. Risk Management needed Risks should be managed
 2. SS Timely SS usefulness
 3. SS Enhance creativity SS usefulness
 4. Control mechanisms needed in spreadsheet development Need of some control mechanisms
 5. SS are critical SS usefulness
 6. Some control needed Need for control mechanisms
 7. SS are flexible SS Usefulness
 8. Off the shelf programmes have errors too (Errors are common)
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9. SS are complementary **SS Usefulness**
10. SS used for complex problems **SS Usefulness**
11. SS are useful **SS Usefulness**
12. Errors same as other disciplines or tools. **Errors are common**
13. SS are useful than programming **SS Usefulness**
14. SS are innovative **SS Usefulness**
15. SS reduce dependence on programmers **SS Usefulness**
16. Technical solutions developed **Technical Solutions Developed**
17. IT Departments don't use SS
18. Lack of documentation **No Documentation**
19. No Standardisation
20. Top management should be involved in SS Risk Management **Risks to be managed by top management**
21. Work pressure leads to lack of documentation **No Documentation**
22. Too much control is not right **Get control right**
23. Spreadsheets prone to risk **SS are risky**
24. SS are powerful **SS Usefulness**
25. Need of standardisation **Need for standardisation**
26. SS used for financial reporting **SS Usefulness**
27. SS are risky **SS are risky**
28. Need for training **Training needed**
29. Low expertise; high expectations **Training needed**
30. Designing Spreadsheet models is programming **SS should be treated same as programming**
31. Urgency leads to errors **Urgency**
32. Test the skills **Training needed**
33. Espoused theory **Overconfidence in developers**
34. SS have limitations **SS have limitations**

Final Themes

1. SS Have limitations **Problems with SS**
2. Overconfidence in developers **Problems with SS**
3. Training needed **Solutions**
4. Urgency **Causes of Errors (Problems with SS)**
5. SS to be treated same as programming **Solutions**
6. SS are risky **Problems with SS**
7. SS are useful **Importance of SS**
8. Need for standardisation **Solutions**
9. Get control right **Solutions**
10. No documentation **Problems with SS**
11. SS Risks to be managed from top. **Solutions**
12. Technical solutions developed **Solutions**
13. Errors are common **Problems with SS**
14. Need for control mechanisms **Solutions**

15. Risks need to be managed Importance of SS

Final Categories

1. Importance of SS
2. Problems with SS
3. Solutions

