

**AN EXPLORATORY ANALYSIS OF QUALITY MANAGEMENT AUDIT
FINDINGS AT A NUCLEAR POWER STATION**

by

ROWENA CHRYSTAL SIMONS

**Dissertation submitted in fulfilment of the requirements for the
degree**

Master of Technology: Quality

in the Faculty of Engineering

at the Cape Peninsula University of Technology

**Supervisor: Mr A Bester
Co-supervisor: Prof M Moll**

Bellville

September 2016

DECLARATION

I, Rowena Chrystal Simons, declare that the contents of this dissertation submitted for the degree Magister Technologiae at the Cape Peninsula University of Technology, represents my own original unaided work, which excludes contributions in the form of guidance from subject matter experts and my supervisors. The dissertation furthermore has not previously been submitted to any institution of higher education towards any qualification. I declare that all sources cited or quoted are indicated and acknowledged by means of a comprehensive list of references. Furthermore the dissertation represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.



Signed

2016/08/22

Date

ABSTRACT

The quality assurance role is an essential function in high risk industries such as the nuclear power industry where process failures can potentially have catastrophic results. As part of mitigating the risk inherent in such industries, the need for reliable quality assurance cannot be over-emphasised. Underpinning a reliable quality assurance function, lies the need for effective identification of risk; as well as effective decision making processes by competent auditors.

A nuclear quality assurance (QA) department has noted an increase in the variability of its audit outcomes, which has resulted in the value of the audit process being questioned by various stakeholders.

The research endeavoured to: explore and describe the practice amongst auditors when rating audit findings; potentially identify reasons for inconsistencies amongst auditors when rating findings; and provide recommendations to improve both the consistency amongst auditors when rating audit finding and the overall performance of the audit process. An exploratory study using the Delphi technique was adopted to enable multiple iterations of qualitative and quantitative data collection and analysis, mimicking elements of a sequential exploratory strategy.

In summary the following key findings were identified during the study:

- In the current research environment variation occurred amongst participants due to their perception of established audit process boundaries.
- Limited correlation between the perceived purpose of rating audit findings and the methodology/criteria currently adopted as part of the rating process.
- Variation in methods used to achieve auditor objectivity and auditor consistency.
- The potential benefit of audit team composition and team dynamics is not fully realised.

- Elements such as: overall auditee perception; positive marketing strategies; and effective communication strategies, have not been fully appreciated as elements that can affect audit effectiveness.

By creating awareness of the various elements that may potentially influence the variability and objectivity amongst auditors as part of the audit process, improved consistency amongst auditors when evaluating audit findings, may be achieved.

Keywords: Audit findings; nuclear; risk; bias; mixed method; auditor; validity; rating, objectivity

ACKNOWLEDGEMENTS

My sincere gratitude to:

My Heavenly Father, for blessing me with the gifts and talents needed to complete this research endeavour.

My loving husband Mario, thank you for your patience and keeping me grounded through all the turmoil. Thank you for reminding me that even though I may be perplexed, that I have no need to be driven to despair. Please know that I could not have overcome all the challenges I faced without your love, support and constant encouragement.

My beautiful daughters, Aimée and Erin, for always believing in me and making me laugh and smile especially when the tears were near. Thank you for your never ending supply of hugs and kisses.

My parents and extended family, for bearing with me, particularly when the pressure to complete was elevated.

The staff of the quality assurance department of Koeberg Nuclear Power station, for your willingness to participate, and provide insight throughout this process.

Mr Richard Smith, for your robust critique, which always seemed to challenge me to re-evaluate and improve.

My Supervisors, Mr André Bester and Professor Mellet Moll, for your constant critique, feedback and support, which ultimately influenced the final outcome.

TABLE OF CONTENTS

CHAPTER 1: SCOPE OF THE RESEARCH	1
1.1. INTRODUCTION AND MOTIVATION	1
1.2. INTRODUCTION	1
1.3. MOTIVATION	2
1.4. BACKGROUND TO THE RESEARCH PROBLEM	4
1.5. STATEMENT OF THE RESEARCH PROBLEM	5
1.6. THE RESEARCH QUESTION	5
1.7. INVESTIGATIVE SUB-QUESTIONS	5
1.8. RESEARCH OBJECTIVES	6
1.9. THE RESEARCH PROCESS	6
1.10. RESEARCH DESIGN AND METHODOLOGY	9
1.11. DATA COLLECTION DESIGN AND METHODOLOGY	9
1.12. DATA VALIDITY AND RELIABILITY/TRUSTWORTHINESS	10
1.13. ETHICS	12
1.14. RESEARCH ASSUMPTIONS	13
1.15. RESEARCH CONSTRAINTS	14
1.16. CHAPTER AND CONTENT ANALYSIS	14
1.17. SIGNIFICANCE OF THE PROPOSED RESEARCH	16
1.18. CONCLUSION	17
CHAPTER 2: BACKGROUND TO THE RESEARCH ENVIRONMENT - VARIABILITY OF AUDIT ACTIVITY RATINGS	18
2.1. INTRODUCTION	18
2.2. BACKGROUND TO THE RESEARCH ENVIRONMENT	18
2.3. THE SCIENCE BEHIND NUCLEAR ENERGY	19
2.4. THE SOUTH AFRICAN CONTEXT	19

2.5.	THE QUALITY ASSURANCE FUNCTION	20
2.6.	THE AUDITING PROCESS	21
2.7.	THE SIGNIFICANCE OF AUDIT FINDINGS	22
2.8.	THE VALIDITY OF AUDIT DATA GENERATED	24
2.9.	EVALUATION OF PREVIOUS AUDIT DATA	26
2.10.	CONCLUSION	30
CHAPTER 3: LITERATURE REVIEW - A DISSECTION OF THE QUALITY MANAGEMENT SYSTEM AUDIT		31
3.1.	INTRODUCTION	31
3.2.	THE PURPOSE OF QMS AUDITS	31
3.3.	AUDIT PROCESS PERFORMANCE	40
3.4.	AUDIT FINDINGS	46
3.5.	AUDITOR ROLE AND PERFORMANCE	52
3.6.	RISK-BASED PROCESS MONITORING	70
3.7.	CONCLUSION	86
CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY		87
4.1.	INTRODUCTION	87
4.2.	AN OVERVIEW OF RESEARCH	87
4.3.	EVALUATING VARIOUS RESEARCH METHODS	90
4.4.	SELECTING AN APPROPRIATE METHODOLOGY	100
4.5.	INSTRUMENTS EMPLOYED: OBSERVATION TECHNIQUES	102
4.6.	SAMPLING AND SELECTION	103
4.7.	DATA TYPE, MEASUREMENTS AND VARIABLES	103
4.8.	OPERATIONALISATION	104
4.9.	RESEARCH ASSUMPTIONS	111
4.10.	RESEARCH CONSTRAINTS	111

4.11.	CONCLUSION	112
CHAPTER 5: DATA COLLECTION, ANALYSIS AND INTERPRETATION OF RESULTS - AN ALTERNATE METHODOLOGY FOR RATING AUDIT FINDINGS		113
5.1.	INTRODUCTION	113
5.2.	EXECUTION OF QUALITATIVE RESEARCH	114
5.3.	RESEARCH QUALITY	114
5.4.	QUALITATIVE DATA ANALYSES	119
5.5.	DATA COLLECTION AND DATA ANALYSIS	120
5.6.	WHAT ELEMENTS AFFECT THE EFFECTIVENESS OF THE QMS AUDIT PROCESS?	124
5.7.	HOW CAN THE LEVEL OF OBJECTIVITY EXERCISED BY AN AUDITOR BE IMPROVED WHEN RATING AUDIT FINDINGS?	135
5.8.	ARE SPECIFIC RISKS CONSISTENTLY IDENTIFIED AND CONSIDERED WHEN FORMULATING THE AUDIT FINDINGS?	144
5.9.	ARE SPECIFIC RISKS CONSISTENTLY IDENTIFIED AND CONSIDERED WHEN RATING AUDIT FINDINGS?	159
5.10.	WHAT ELEMENTS INFLUENCE THE CONSISTENCY AMONGST AUDITORS WHEN RATING QMS AUDIT FINDINGS?	170
5.11.	PRIMARY RESEARCH QUESTION AND ASSOCIATED OBJECTIVE	189
5.12.	CONCLUSION	193
CHAPTER 6: CONCLUSION		194
6.1.	INTRODUCTION	194
6.2.	THE RESEARCH PROBLEM REVISITED	194
6.3.	THE RESEARCH QUESTION REVISITED	195
6.4.	THE INVESTIGATIVE SUB-QUESTIONS REVISITED	195
6.5.	RESEARCH OBJECTIVES REVISITED	196
6.6.	RESEARCH DESIGN AND METHODOLOGY REVISITED	196
6.7.	DATA COLLECTION, ANALYSIS AND INTERPRETATION OF RESULTS REVISITED	197

6.8.	RESEARCH FINDINGS	198
6.9.	ANALYSIS AND RECOMMENDATIONS DRAWN FROM RESEARCH FINDINGS	199
6.10.	RECOMMENDATIONS FOR FURTHER RESEARCH	202
6.11.	RESEARCH CONCLUSIONS	202
	LIST OF REFERENCES	203

LIST OF APPENDICES

Appendix 1: Criteria for rating of the audit finding	213
Appendix 2: Criteria for rating audit activity	214
Appendix 3: Historical audit data evaluated for the period 2008-2010	215
Appendix 4: First iteration of the Delphi questionnaire	218
Appendix 5: Second iteration of the Delphi questionnaire	218
Appendix 6: Rating criteria considerations	219
Appendix 7: Risk ranking survey	219
Appendix 8: Applied elements survey	220
Appendix 9: Rating survey	220
Appendix 10: Response to round 1 of the Delphi evaluation	221
Appendix 11: Individual participant's risk identification	223
Appendix 12: Results of ranking exercise	224
Appendix 13: Results of rating exercise	226
Appendix 14: Results of the second round of the Delphi evaluation	227

LIST OF TABLES

Table 3.1: Components of an effective audit	45
Table 3.2: Theories related to auditor independence	56
Table 3.3: Types of Cognitive functionality	60
Table 3.4: Elements of the competency framework of the Chartered quality institute	69
Table 3.5: Definitions of risk	71
Table 3.6: Dissection of the aspect of risk assessment	72
Table 3.7: Methods employed in determining the key concepts related to risk	77
Table 3.8: Strategies used in determining tolerance levels	79
Table 3.9: Types of cognitive theories related to risk evaluation	80
Table 4.1: Key differences between qualitative and quantitative research	90
Table 5.1: Sample of questions used to evaluate qualitative research	115
Table 5.2: Types of triangulation	117
Table 5.3: Common data collection errors	119
Table 5.4: An overview of the four steps of QDA	120
Table 5.5: Data collected during round 1 of the Delphi evaluation	126
Table 5.6: Data collected during round 2 of the Delphi evaluation	128
Table 5.7: Keys aspects influencing overall auditee/ customer satisfaction	131
Table 5.8: Respondent feedback to Delphi evaluation	132
Table 5.9: Data collected during round 1 of the Delphi evaluation	136
Table 5.10: Data collected during round 2 of the Delphi evaluation	138
Table 5.11: Respondent feedback related to Delphi evaluation	142
Table 5.12: Data collected during round 1 of the Delphi evaluation	145
Table 5.13: Data collected during round 2 of the Delphi evaluation	147
Table 5.14: Specific responses captured for the second survey	150

Table 5.15: Respondent feedback related to Delphi evaluation	155
Table 5.16: Respondent feedback for second survey	156
Table 5.17: Elements of an effective measurement	157
Table 5.18: Data collected during round 1 of the Delphi evaluation	160
Table 5.19: Data collected during round 2 of the Delphi evaluation	162
Table 5.20: Auditor descriptions of risk categories change	166
Table 5.21: Respondent feedback related to the Delphi evaluation	167
Table 5.22: Respondent feedback related to the risk ranking exercise	168
Table 5.23: Data collected during round 1 of the Delphi evaluation	172
Table 5.24: Data collected during round 2 of the Delphi evaluation	173
Table 5.25: Specific responses captured for applied elements survey	176
Table 5.26: Analysis of the single element categories	180
Table 5.27: Analysis of multiple element categories	180
Table 5.28: Percentage distribution of correct ratings per grading	183
Table 5.30: Respondent feedback related to the Delphi evaluation	185
Table 5.31: Respondent feedback related to the applied element survey	186
Table 5.32: Respondent feedback related to rating exercise	186

LIST OF FIGURES

Figure 2.1: Audit/report process	21
Figure 2.2: Process for rating audit elements	22
Figure 2.3: Organisational structure	23
Figure 2.4: Potential causes for inconsistent audit outcomes	24
Figure 2.5: The distribution of nonconformity ratings for 'mostly met' audits.	27
Figure 2.6: The distribution of nonconformity ratings for 'partly met' audits	28
Figure 2.7: The distribution of nonconformity ratings for "not met" audits	29
Figure 3.1: The evolution of quality auditing	32
Figure 3.2: High level audit process map	41
Figure 3.3: The Four factor model	41
Figure 3.4: Contributors to effective performance	65
Figure 3.5: The effects of reflection on professional competence	66
Figure 3.6: Competency framework	68
Figure 3.7: Overview of a typical quality risk management process	73
Figure 3.8: Components of risk analysis	74
Figure 3.9: Likelihood vs Consequence plot	78
Figure 4.1: Practical steps for identifying a research methodology	88
Figure 4.2: Traditional research framework	89
Figure 4.3: Sequential explanatory strategy	94
Figure 4.4: Sequential exploratory strategy	95
Figure 4.5: Sequential transformative strategy	95
Figure 4.6: Concurrent triangulation strategy	96
Figure 4.7: Concurrent embedded strategy	96
Figure 4.8: Concurrent transformative strategy	97

Figure 4.9: Operationalisation methodology employed	105
Figure 4.10: Operationalisation for research question 1	106
Figure 4.11: Operationalisation for research question 2	106
Figure 4.12: Operationalisation for research question 3	107
Figure 4.13: Operationalisation for research question 4	108
Figure 4.14: Operationalisation for research question 5	109
Figure 4.15: Operationalisation for the primary research question	110
Figure 5.1: Focus areas for Chapter 5	113
Figure 5.2: Sequential exploratory strategy	113
Figure 5.3: Applied research framework	121
Figure 5.4: Elements affecting audit effectiveness used for classifying data	123
Figure 5.5: Research framework adopted for research question 1	124
Figure 5.6: Round 1- Question 1	126
Figure 5.7: Round 2- Q1.1	128
Figure 5.8: Round 2- Q1.2	129
Figure 5.9: Round 2- Q1.3	129
Figure 5.10: High level audit process map with perceived boundary	133
Figure 5.11: Research framework adopted for research question 2	135
Figure 5.12: Round 1 – Question 2	136
Figure 5.13: Round 2- Q2.1	139
Figure 5.14: Round 2- Q2.2	139
Figure 5.14: Round 2- Q2.3	140
Figure 5.16: Research framework adopted for research question 3	144
Figure 5.17: Round 1 – Question 3	146
Figure 5.18: Round 2- Q3.1	148

Figure 5.19: Round 2- Q3.2	148
Figure 5.20: Round 2- Q3.3	149
Figure 5.21: Initial classification of data collected	151
Figure 5.22: Secondary classification of data collected	151
Figure 5.23: Distribution of terms noted associated with risk/consequence	153
Figure 5.24: Cumulative risk considerations per respondent	153
Figure 5.25: Research framework adopted for research question 4	159
Figure 5.26: Round 1- Question 4	160
Figure 5.27: Round 2- Q4.1	162
Figure 5.28: Round 2- Q4.2	163
Figure 5.29: Results of Q4.3	163
Figure 5.30: Percentage distribution of highest ranked risk area per audit finding	165
Figure 5.31 Research framework adopted for research question 5	170
Figure 5.32: Round 1-Question 5	172
Figure 5.33: Round 2- Q5.1	174
Figure 5.34: Round 2- Q5.2	174
Figure 5.35: Round 2- Q5.3	175
Figure 5.36: Distribution of responses related to finding description	177
Figure 5.37: Distribution of responses related to rating a finding	178
Figure 5.38: Distribution of responses related to formulating a justification	179
Figure 5.39: Cumulative distribution of responses amongst auditors	179
Figure 5.40: Inputs to the rating process	180
Figure 5.41: Process chosen for the duration of the study	181
Figure 5.42: Percentage distribution of ratings for each audit finding	182
Figure 5.43: Percentage of “correct” rating responses	183

Figure 5.44: Input elements to formulating an audit finding description	187
Figure 5.45: Input elements to formulating an audit finding justification	187
Figure 5.46: Input elements to rating an audit finding	188
Figure 5.47: Elements affecting audit effectiveness revisited	192
Figure 6.1: High level steps for implementation of recommendations	201

GLOSSARY OF TERMS

- Efficacy:** The ability to achieve a desired or intended purpose (Oxford dictionaries: **Online**).
- Bias:** A cognitive shortcut which has the potential to lead to rash decisions or discriminatory practices (Psychology Today: **Online**).
- Risk:** The effect of uncertainty on objectives related to quality and safety, where an effect is a deviation from the expected outcome and may be positive or negative. Risk is often characterised by reference to potential events and consequences or a combination of these factors and the associated likelihood of the event (ISO: 2009).
- Independence:** The basis for the impartiality and objectivity as related to the audit activity and the audit conclusions as exercised by auditors who are free from bias and conflict of interest (ISO: 2011).
- Significance:** Significance in terms of audit findings, is particularly concerned with risk identification and risk management (Beckmerhagen, Berg, Karapetrovic, & Willborn, 2004:18:**Online**).
- Accuracy:** A characteristic of a measurement having low systematic error- that is, not consistently over- or underestimating a value (Hubbard, 2010:133).
- Precision:** A characteristic of a measurement having low random error; highly consistent results even if they are far from the true value (Hubbard, 2010:133).

CHAPTER 1: SCOPE OF THE RESEARCH

1.1. INTRODUCTION AND MOTIVATION

“A problem well stated is a problem half solved”

Charles Kettering (1876-1769)

In this chapter the research topic and the associated research problem is introduced and explored in order to formulate: the research problem statement; the specific research questions; and the associated research objectives. The areas considered as part of this dissection were as follows:

- Introduction to the research topic.
- Motivation for the research.
- Background to the research.
- Research questions and objectives.
- The research process and related actions; assumptions and constraints.
- And finally, the significance of the research.

1.2. INTRODUCTION

The business management approach of Total Quality Management (TQM) and Quality Management Systems (QMS) has consistently been associated with organisations that aim to improve both its productivity and its level of customer satisfaction. Through improved productivity and customer satisfaction, organisations aim to ultimately improve its business performance and market share (Rampersad, 2001:vii).

As part of adopting an effective and value-adding business management approach such as Quality Management (QM), it is required that constant monitoring and measuring of an organisation's processes and systems be performed in order to effect change and improvement where needed. These changes should ideally be brought about by decisions which are based on the collection, review and analysis of data and information.

Currently, one method employed by organisations to collect the relevant data and monitor the health of the QMS and the associated systems and processes, is the QMS audit (Kakkad & Ahuja, 2014:2652:**Online**).

The QMS audit is performed by the QMS auditors who are expected to be: skilled; competent; and possess a fair knowledge base related to relevant standards and the eight quality management principles. It is expected that these auditors execute audits objectively and effectively in order to identify significant anomalies that require attention. Anomalies that if left attended could result in organisations incurring cost or suffer loss (Robitaille, 2014:26; Barthelemy & Zairi, 1994:46:**Online**).

Recently questions by stakeholders related to the practice amongst QMS auditors when performing audits in a nuclear environment have surfaced, initiating this exploratory analysis in this area.

1.3. MOTIVATION

In the nuclear industry, it is imperative that an organisation's quality assurance department verify compliance with required safety codes and standards, which are imperative for the safe operation of a nuclear plant. Key to providing this assurance is the performance of process audits which provides the platform for collecting and analysing critical information. Since the information analysed is reported and provides assurance of safe operation, it is paramount that the information be consistent, reliable and considered value-adding. This need for reliable data is especially critical in high risk organisations such as the nuclear industry where failure of processes to conform to the afore-mentioned safety codes and standards can have catastrophic results (Beckmerhagen, Berg, Karapetrovic & Willborn, 2004:15:**Online**).

Koeberg Nuclear Power Station (KNPS) is involved in the safe and sustainable production of electricity, using nuclear energy. While producing electricity in this manner, it is critical to adhere to specific regulatory requirements as set out by legislation and as enforced by the

National Nuclear Regulator of South Africa (NNR) (National Nuclear Regulator Act 47, 1999:12).

In order to comply with these regulatory requirements, it is required that a quality assurance (QA) department be established and maintained. The mandate of the QA department is to perform process based QMS audits in order to provide the assurance, needed by the organisation, of compliance to the afore-mentioned legislation (National Nuclear Regulator Act 47, 1999:12).

Auditors in the QA department have been identified as the subject matter for the research study for the following reason: Recently an increase in the variability of audit outcomes and audit conclusions was noted through stakeholder feedback. The noted inconsistency required interrogation as the variability of the resultant audit conclusions resulted in the perception of reduced efficacy, as related to reliability and credibility, of the quality audit process by stakeholders.

In brief, the research aims to explore the fundamentals of the QMS audit with the intent of: identifying reasons for the variability amongst auditors; and subsequently provide recommendations for improving the consistency in audit outcomes, which include rating audit findings. Since audit findings are the building blocks for the audit conclusion, the anticipated improvement in consistency amongst auditors when rating audit findings may potentially impact positively on the reported audit conclusions. Collectively the effect may alter the perception of the stakeholders as related to the reliability of the audit outcomes and the credibility of the involved auditors. This change noted in the stakeholder perception may holistically result in an increase in the level of confidence associated with the audit outcome.

The significance of the research is noted in the area of controlling subjectivity associated with QMS audit findings. If the subjectivity can be controlled, the impact of the data generated as part of the QMS audit may prove to be invaluable to all organisations wanting to remain viable in

today's economic climate. In addition, the significance of the research may be beneficial to the nuclear industry, the quality industry and the academic community.

1.4. BACKGROUND TO THE RESEARCH PROBLEM

The QA department consists of auditors with varying technical backgrounds, who execute audits primarily to identify process deficiencies and provide assurance that QMS process objectives are being met. These audits are also used to identify potential risks to process outputs and overall business objectives.

The information gathered during the audit process forms the basis from which an organisation's process performance is monitored and measured and from where both corrective and preventive actions are initiated. Actions which are expected to mitigate risks to business processes, ensuring process objectives are consistently met. Hence audit outcomes and resultant decisions in theory could result in the allocation of resources (time, personnel, consumables), and therefore a factual approach to decisions in this regard is necessary.

QMS auditors currently grade individual audit findings into specific categories according to the criteria noted in Appendix 1. The rating assigned is considered to reflect the severity of the identified audit finding in relation to the consequence and the associated risk to the process outputs. In turn the findings collectively influence the audit outcome and audit activity rating and is therefore indicative of the risk to the management system as a whole (Eskom Procedure, 2012:6). The categories assigned in practice are: high; medium; and low.

In the researcher's opinion, inconsistencies in the audit outcomes have been as a result of shortcomings in the current criteria and methodology employed by auditors when rating audit findings and audit activities. The inconsistent practice has consequently resulted in the following:

- Difficulty in defending the basis for choosing a particular audit rating and conclusion to the relevant stakeholders.
- Difficulty in consistently and objectively communicating the risk to the quality management system based on the severity of identified audit findings to the relevant stakeholders.

The research study aims to explore the reasons for the increased variability amongst auditors when rating audit findings and audit activities, and in so doing appropriately address the symptoms noted above. The research will also respond to a business need as identified by the organisation and a recommendation from a previous study performed in this area by Smith, Bester and Moll (2013:102).

1.5. STATEMENT OF THE RESEARCH PROBLEM

Against the above background, the problem to be researched reads as follows: Inconsistency amongst Quality Management System (QMS) auditors when evaluating individual audit findings has led to an increase in the variability of the resultant audit conclusions.

1.6. THE RESEARCH QUESTION

The research question to be investigated reads as follows:
How will the audit process and the associated outcomes be affected by improving the consistency amongst auditors when rating individual audit findings?

1.7. INVESTIGATIVE SUB-QUESTIONS

The following investigative sub-questions will be researched in order to expand on the research question:

- What elements affect the effectiveness of the QMS audit process?
- How can the level of objectivity exercised by an auditor be improved when rating audit findings?
- Are specific risks consistently identified and considered when formulating the audit findings?

- Are specific risks consistently identified and considered when rating audit findings?
- What elements influence the consistency amongst auditors when rating audit findings?

1.8. RESEARCH OBJECTIVES

The primary research objective is as follows:

- To explore and describe the practice amongst auditors when rating audit findings; potentially identify reasons for inconsistencies amongst auditors when rating findings; and provide recommendations to improve both the consistency amongst auditors when rating audit finding and the overall performance of the audit process.

The secondary research objectives have been identified as follows:

- To determine the elements that affect the effectiveness of the QMS audit process.
- To determine the elements that affect the level of objectivity exercised by an auditor when rating audit findings.
- To determine whether specific risks are consistently identified and considered when formulating the audit findings.
- To determine whether specific risks are consistently identified and considered when rating audit findings.
- To determine the elements that influence consistency amongst auditors when rating audit findings.

1.9. THE RESEARCH PROCESS

Walliman (2010:29-33), returned that the research process can be considered the non-specific framework within which a research project is executed. The process starts with identifying the research problem and culminates in communicating a conclusion. Four pertinent questions provide the necessary guidance to navigate any research study. These questions are: *what, why, how and when*, as related to the research topic.

By answering these specific questions, key aspects of the research process are revealed.

In answering the questions above, Mouton (2001:114) responds by providing a progressive approach that includes the following steps:

- Determine the research problem.
- Evaluate appropriate literature to determine context.
- Design the research methodology and approach.
- Collate the evidence collected and analyse appropriately.
- Interpret, conclude and make recommendations.

Answering these questions noted by Walliman (2010) translates directly into the action steps of the research process. Similar steps are returned by Jackson (2011:27) which have been expanded on in the following sections.

1.9.1. Identifying a specific problem

The purpose of this step is predominantly exploratory in nature and is focused on developing the context of the research study (Jackson, 2011:27). The step requires consideration of the following items:

- Identifying the area or field of study.
- Identifying a specific problem.
- Exploring the context in which the problem exists in order to determine the value and significance of the proposed study.

1.9.2. Reviewing the literature extensively

The exploratory phase of the research study continues with the literature survey. The main objective of the literature survey is as follows (Jackson, 2011:27):

- Gaining insight into the complexity of the problem as well as assist in refining the research problem.
- Translating the research problem into a research question.

1.9.3. Formulating the research problem statement; research questions; and research objectives

In order to clarify the purpose of the research study, the following are considered (Jackson, 2011:27):

- Further refinement of the research question into associated investigative sub-questions.
- Define the key research objectives for the execution phase of the research study.

1.9.4. Designing and conducting the study

Depending on the purpose of the research study as well as the information and data available, various approaches may be adopted. The formulation of the roadmap and the execution thereof should include the following (Jackson, 2011:27):

- Explore various methods for data collection using applicable literature in order to select an appropriate research design and methodology.
- Compile a schedule with key milestones and related work plan to facilitate actions and timing of the research activity.
- Identify applicable limitations of the research study gleaned from various sources.

Once the framework has been developed, the execution and conclusion of the study is facilitated using the steps noted in the following sections.

1.9.5. Analysing the data and interpreting the results

Depending on the type of data collected (quantitative and/or qualitative), various methods may be adopted to analyse the information gathered, in order to make sense of the data and ultimately answer the research questions being investigated (Jackson, 2011:27).

1.9.6. Reviewing the results in order to conclude and commence reporting

Reviewing both the raw data and the analysed data is a critical step in ensuring that a credible research report is compiled (Jackson, 2011:27).

1.9.7. Compile a detailed research document and submit for review and approval

All the steps noted above, are used as the non-specific framework within which the research questions and objectives are investigated. This will result in the completed research document, which expresses the rationale underpinning the research study (Mouton, 2001:113).

1.10. RESEARCH DESIGN AND METHODOLOGY

In order to evaluate the variability amongst QMS auditors when rating QMS audit findings, the Delphi evaluation technique with elements of a mixed method approach (sequential exploratory strategy) was selected as the most appropriate research methodology.

1.11. DATA COLLECTION DESIGN AND METHODOLOGY

Creswell (2003) returned that researchers may decide to employ either a qualitative or quantitative research approach when performing research. In addition, depending on the variables identified, a vast array of techniques may be used, in order to ensure usable data is collected and research objectives are met.

Mouton (2001:99-110) encourages researchers to identify and select the data sources wisely, being aware of issues that may arise due to selecting certain data types. Mouton continued to systematically highlight common errors that require consideration as part of selecting data sources and selecting data types. Aspects related to data sources have been included in Section 1.12.

As part of the research study, the following have been identified as the most appropriate forms of data collection techniques which could generate both quantitative and qualitative data (Blaxter, Hughes & Tight, 2006):

- Questionnaires/surveys at various stages of the research.
- Review of historical data.

1.12. DATA VALIDITY AND RELIABILITY/TRUSTWORTHINESS

Blaxter, Hughes and Tight (2006:67) returned that in any research study it is of utmost importance to identify the specific data needed to achieve the stated research objectives and answer the primary and secondary research questions. Besides identifying the data source, Blaxter, Hughes and Tight (2006:154 & 158), returned that data collection would require continuous evaluation and adjustment in the following areas:

- Sampling and selection considerations.
- Application of different data collection techniques.
- Recording of data.
- Ethical considerations.

These considerations will be discussed further in the following sections.

1.12.1. Sampling and selection

According to Blaxter, Hughes and Tight (2006:165), the type of sampling decided upon could be influenced by the knowledge of the participants involved as well as the resources available, which may include time.

Providing additional insight to sampling, Welman and Kruger (2001:53-63) extensively evaluated sampling types used as part of research. For the research study, it is planned to select all members of the quality assurance department to participate in the surveys; completion of questionnaires; and the reviewing of existing data, where possible. Where the whole population cannot be accessed, accidental sampling will be applied. Welman and Kruger (2001:62) claimed that this type of sampling selects members of a population based on availability and accessibility for the purpose of the research.

The historical data that will be utilised for the research study consisted of audit finding data collected for the period, 2008-2010.

1.12.2. Application of different data collection techniques

The Delphi technique with elements of a sequential exploratory strategy allows for a number of techniques for data collection to be adopted, depending on the type of Delphi technique implemented (Turoff & Linstone, 2002:Online).

As part of collecting data, Blaxter, Hughes and Tight (2006:172 & 181) as well as Creswell (2003:17) advise that data collection techniques could include: the use of various questionnaire types; and the analysis of pre-existing data.

The various types of questionnaires identified and chosen for inclusion in the research study are (Blaxter, Hughes & Tight, 2006:181):

- List of multiple choice options.
- Open ended questions.
- Scale type.

1.12.3. Recording of data

It is the role of the researcher to constantly evaluate whether the research objectives will be met and whether the research questions will be answered using the data collected. For this reason, accurate data collection followed by accurate and appropriate analyses would be required. This constant re-evaluation will take place before and after all questionnaires are administered (Zikmund, 2003:72).

1.12.4. Ethical considerations

According to Babbie (2010:63), although ethical considerations are necessary in all research type methodologies, it is perceived as a major consideration in social research where participation by individuals, is required.

Babbie (2010:67-70); Blaxter, Hughes and Tight (2006:160); and Leedy and Omrod (2005:101-102), all suggested that the following elements be considered when human participation is required in research:

- Confidentiality.
- Anonymity.
- Legality.
- Professionalism.
- Participation.

In the section that follows, supplementary information regarding ethics will be discussed.

1.13. ETHICS

According to Walliman (2010:43), ethics can be divided broadly speaking into two aspects which will briefly be discussed in turn:

- The values possessed by the researcher.
- Interaction of researcher with participant.

1.13.1. The values possessed by the researcher

Walliman (2010:43-45), elaborated on the qualities a researcher is expected to possess:

- Honesty.
- Consideration of intellectual ownership.
- Accurate reflection and presentation of data and information collected.
- Use of neutral language in both interaction with participants and presentation of research.

In the same way Mouton (2001:240) highlighted equivalent qualities highlighting the following attributes such as: honesty; objectivity; integrity; and transparency.

1.13.2. Interaction of researcher with participant

Walliman (2010:43) noted the relevant attributes required of a researcher when interacting with participants:

- Approval and consent.
- Confidentiality.
- Anonymity.
- Courtesy.
- Protection from harm.

Mouton (2001:240-244) identified similar elements to that noted by Walliman (2010), and as part of the research study, cognisance will be taken of all the ethical considerations mentioned in relation to both the researcher and participant interaction.

1.14. RESEARCH ASSUMPTIONS

Walliman (2010:15-16) averred that research consists fundamentally of: collecting data and information; interpreting this data and information; and subsequently developing an understanding of a particular concept, in order to acquire knowledge. Walliman (2010) continued that since researchers perceived situations through their own experiences and world views, assumptions are made by researchers that may influence the manner in which the specific research is executed. Identifying the assumptions made by a researcher is therefore crucial to adding credibility to any study.

The following research assumptions have been identified as part of this research study:

- Auditors participating in the study are all suitably qualified and competent.
- Auditors participating in the study have all been exposed to equivalent induction programmes.
- Auditors participating in the study are all willing participants.
- Auditors participating in the study perceive the research study in a positive light with potential business performance benefits.

- The use of historical data as part of the research study is considered to not impact negatively on the research study.

1.15. RESEARCH CONSTRAINTS

Welman and Kruger (2001:79) highlighted that research performed in a workplace environment usually results in a situation where the researcher is unable to control all interventions participants are exposed to. As part of the challenges facing a researcher, Welman and Kruger (2001:107-108) warns that participants are generally biased and partial by nature and therefore involving participants in a research study always poses a risk to the outcome of the research study. The authors speak of the manifestation of '*the subject effect*'. This phenomenon refers to where participants are affected by other aspects of the research study outside of the researcher's control. As part of the *subject effect*, Welman and Kruger (2001:108) highlighted the tendency of participants to respond and react either intentionally or unintentionally in a particular manner dependent on the participant's perception of the research study. In order to counter the *subject effect*, the researcher proposed using triangulation of data sources and possibly triangulation of methods.

1.16. CHAPTER AND CONTENT ANALYSIS

The chapter content and analysis has been adopted from Mouton (2001:122-125), and have been captured as follows:

1.16.1. Chapter 1: Scope of the research

The identified research problem as well as the necessary motivation for the study is captured in this chapter. The research problem statement; the research questions; and the research objectives are also captured at this stage (Mouton, 2001:122).

**1.16.2. Chapter 2: Background to the research environment -
Variability of audit activity ratings**

This chapter contextualised the environment in which the research problem has been identified and further provides the supporting information needed to promote the need for the research study (Mouton, 2001:122).

**1.16.3. Chapter 3: Literature review - A dissection of the Quality
Management System audit**

This particular chapter extensively interrogated the available and applicable literature. The purpose of the review was to identify a plausible framework to support the execution of the research study (Mouton, 2001:123).

1.16.4. Chapter 4: Research design and methodology:

In this chapter the researcher evaluated sound literature sources in order to select the most appropriate research methodology. Once chosen, the detailed methodology adopted was discussed, including: the instruments employed; the measurements and key variables to be used for the study; as well as the details of the methods used in collecting and analysing data (Mouton, 2001:123).

**1.16.5. Chapter 5: Data collection, analysis and interpretation of
results - An alternate methodology for rating audit findings**

The culmination of all the results gathered as part of the research study was exhibited at this point. The results were presented, discussed and interpreted, providing clarity where needed and linked to the literature reviewed, where possible (Mouton, 2001:124).

1.16.6. Chapter 6: Conclusion

The relevant outcomes of the research study, along with any pertinent points and ideas, are presented in the concluding chapter. As part of the conclusion, the relevance of the study as well as recommendations for further study related to the research topic is included (Mouton, 2001:124).

1.17. SIGNIFICANCE OF THE PROPOSED RESEARCH

In high risk organisations the need for reliable quality assurance data has been shown to be imperative. The research will explore and describe the practice amongst auditors when rating audit findings; potentially identify reasons for inconsistencies amongst auditors when rating findings; and provide recommendations to improve both the consistency amongst auditors when rating audit finding and the overall performance of the audit process.

It is expected that an improved level of consistency amongst auditors will be achieved, when rating the QMS audit findings, if the identified recommendations are implemented. Subsequently, the reliability of the resultant QMS audit conclusions will improve, resulting in improved confidence in the value and significance of the QMS audit process, by various stakeholders. In summary, by consistently providing value-adding and significant audit findings, the following consequences are envisaged:

- Reliability of the resultant QMS audit conclusions will improve.
- Improved confidence in the value and significance of the QMS audit process.
- Improved resolution of nonconformities and perceived areas of improvement.
- Enhanced business performance which also includes maintaining nuclear safety.
- Provision of reliable quality assurance data within high risk organisations.

1.18. CONCLUSION

In this chapter the research topic and the associated research problem was introduced and explored resulting in the formulation of: the research problem statement; the specific research questions; and the associated research objectives. In addition all aspects necessary for the successful completion of the research study were considered and evaluated, providing the framework in which to execute the research study.

In the following chapter, the research environment was examined in order to provide the necessary context for the research problem and the overall research study.

CHAPTER 2: BACKGROUND TO THE RESEARCH ENVIRONMENT - VARIABILITY OF AUDIT ACTIVITY RATINGS

2.1. INTRODUCTION

In this chapter the research environment will be delved into, providing the necessary context for the research problem and the overall research study. This chapter will methodically evaluate the research environment using the following outline:

- Background to the research environment.
- The science behind nuclear energy.
- The South African context.
- The quality assurance function.
- The auditing process.
- The value of audit findings.
- The validity of audit data generated.
- The evaluation of previous audit data.

2.2. BACKGROUND TO THE RESEARCH ENVIRONMENT

Worldwide countries are constantly searching for plausible solutions to satisfy a growing demand for electricity. According to the World Nuclear Association (2014:**Online**), the world's energy demands will increase over the next twenty years and associated with this increased demand is the growing need for electricity.

To meet this increasing need for electricity, sixteen percent of the world's electricity needs are currently being generated using nuclear energy. This type of energy is considered an effective alternative source of electricity and complimentary to coal, hydro and other sources of renewable energy (Eskom, n.d.:**Online**).

The safe production of nuclear energy however hinges primarily on the controlled execution of production processes. As part of these production

processes within the nuclear industry, the role of quality management and quality assurance have been identified as critical (Regulatory procedure, 1999:9). The reason for the increased focus on: safe operation; controlled execution of production processes; and the link to the unique technology of nuclear energy, will be discussed in the next section.

2.3. THE SCIENCE BEHIND NUCLEAR ENERGY

Nuclear energy is produced through a process known as fission. The fission process results in the splitting of an atom's nucleus after the absorption of a neutron. The fission process results in the release of energy in the form of heat and radiation. As part of the fission process, neutrons are released which are then absorbed by the nucleus of another atom, resulting in a sustained nuclear chain reaction. At a nuclear plant as part of the fission process, the Uranium-235 atom is used as a source of fuel. The energy released as part of the fission process is then used to heat water and produce steam which forms a central element in the process of generating electricity. Inherent to the fission process is the production of radioactive by-products that may potentially harm man and environment. The need to control these radioactive by-products, necessitates the strict management of processes, which ensure the safe operation of all nuclear power generation plants (Eskom, n.d.:**Online**).

2.4. THE SOUTH AFRICAN CONTEXT

In South Africa, Eskom generates approximately 95% of the electricity utilised within the country. Besides generating electricity, Eskom's core business activities also include transmitting and distributing electricity. As part of Eskom's power generation fleet which consists mainly of coal-fired power stations, Koeberg Nuclear Power Station (KNPS) in the Western Cape is currently Eskom's only nuclear power generation plant. As part of its generation capacity, KNPS supplies approximately 5% of South Africa's total electricity needs (Eskom, n.d.:**Online**).

In order for KNPS to operate and generate electricity in a sustainable and responsible manner, compliance to regulatory requirements as stipulated in the National Nuclear Regulatory Act (47 of 1999) is required. In order to provide assurance of compliance to radiation protection and nuclear safety principles needed for the safe operation, process audits are executed by the quality assurance (QA) department at KNPS. It is this aforementioned (QA) department, which has been identified as the subject matter for this research project (Regulatory procedure, 1999:9).

2.5. THE QUALITY ASSURANCE FUNCTION

The QA department performs process audits in order to provide assurance that processes at KNPS are established and maintained in a manner that ensures the prevention of a nuclear or radiation incident or accident. The outcome of these audits are examined and interrogated by various levels of management within the organisation as well as multiple external stakeholders to the organisation, which include the National Nuclear Regulator (NNR).

Recently, concerns have been raised in various management level forums regarding the consistency (repeatability) of the overall audit outcomes, particularly the audit activity ratings which are determined by auditors within the QA department. The perceived lack of consistency has prompted questions related to the practices within the QA department, specifically related to the following which will be discussed next:

- The auditing process.
- The value of audit findings and associated ratings.
- The validity of the audit data generated.

2.6. THE AUDITING PROCESS

The quality auditing process consists of various phases, with each phase (planning, execution and reporting) having pre-defined inputs and outputs as depicted in Figure 2.1.

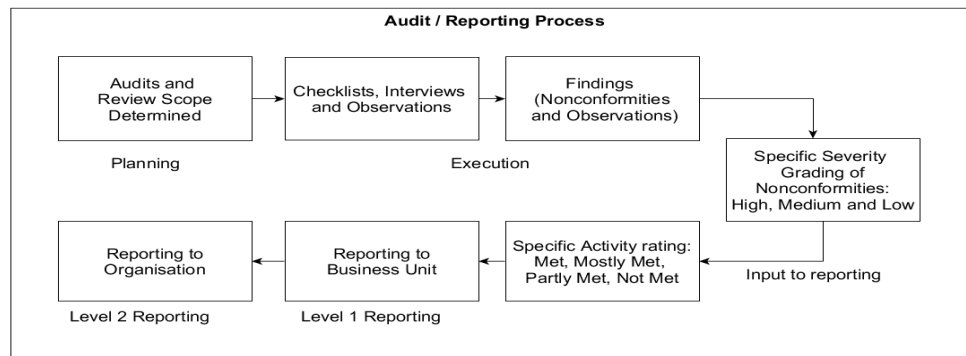


Figure 2.1: Audit/report process

(Source: Own source)

During the reporting phase, the objective evidence gathered as part of the execution phase is assessed, evaluated and formulated into audit findings. The audit findings, which include nonconformities and observations, are then cumulatively reviewed by an audit team, resulting in an audit activity rating and conclusion.

Specifically, the current practice within the aforementioned QA department, starts with the individual audit findings (nonconformities) being classified into specific categories according to a rating scale which measures the finding in terms of severity, seriousness and risk. The rating assigned to an audit finding can therefore be one of the following (Eskom procedure, 2012:28; Eskom procedure, 2013:6):

- High.
- Medium.
- Low.

Once audit findings are graded, the cumulative effect of the nonconformities and observations noted during the audit are assessed using specific criteria, as noted in Appendix 2, resulting in the overall audit

activity rating. It is this cumulative effect of the nonconformities and observations which in turn will result in the overall audit conclusion. The process described above has been represented in Figure 2.2.

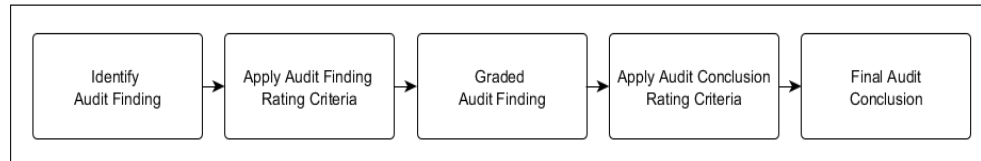


Figure 2.2: Process for rating audit elements

(Source: Own source)

Similarly, Smith, Bester and Moll (2014:80:**Online**), provided the following explanation for grading nonconformities (NCs),

“The NCs are graded according to their potential consequences for the business. This relates to the potential effects or consequences of the nonconformity within the context where the nonconformity manifested itself, graded as a High (H), Medium (M), or Low (L) consequence.”

The rating of each audit finding therefore reflects the severity of the finding and the associated risk to the QMS process outputs and may therefore be indicative of the risk to the quality management system as a whole (Eskom procedure, 2012:28; Eskom procedure, 2013:6).

2.7. THE SIGNIFICANCE OF AUDIT FINDINGS

According to the International Organisation for Standardisation (2005:17),

“Audit findings are the result of the evaluation of the collected audit evidence against audit criteria.”

In addition the International Organisation for Standardisation (2005:17) provides the following,

“The audit conclusion is the outcome of an audit provided by the audit team after consideration of the audit objectives and all audit findings.”

In order to appreciate the general significance of audit findings raised within the research environment, an overview of the existing organisational structure is required. Even though the QA department has a direct reporting line to the Nuclear Oversight organisation, the department performs process audits in all the areas noted in Figure 2.3, providing assurance to all business areas within the Koeberg Operating Unit (KOU).

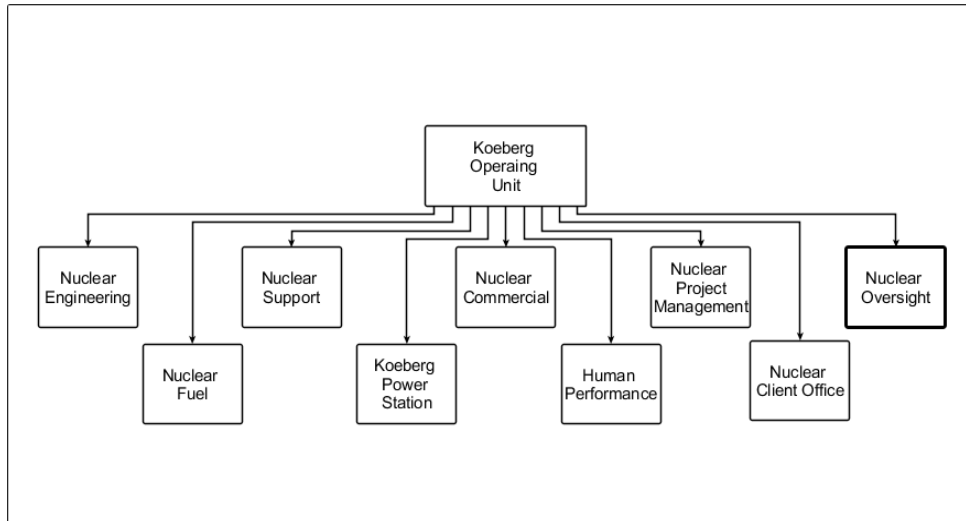


Figure 2.3: Organisational structure
(Source: Eskom Procedure, 2014)

Due to the organisational position of the QA department, the results of the quality audits are interrogated by management within the organisation as well as multiple external stakeholders. Each stakeholder has a unique function, mandate, interest and focus and for this reason, the audit findings documented in audit reports are read and interpreted with a certain perception and mind-set.

The focus of the various role players include elements such as:

- Legal and statutory requirements.
- Regulatory requirements.
- Production and plant reliability factors.
- Process and QMS requirements.
- Nuclear safety/Plant safety.

Recently, questions have been raised in various management level forums regarding the perceived inconsistency and noted variations amongst auditing teams when rating the overall audit activities. In order to address the questions and concerns raised by the various stakeholders, the QA department identified the need to assess the current practises related to the rating of audit activities.

2.8. THE VALIDITY OF AUDIT DATA GENERATED

In order to evaluate the possible reasons for the perceived inconsistency in the audit outcomes, a simple cause map was compiled, resulting in the identification of possible causes for the inconsistency. Potential causes have been depicted in the Figure 2.4.

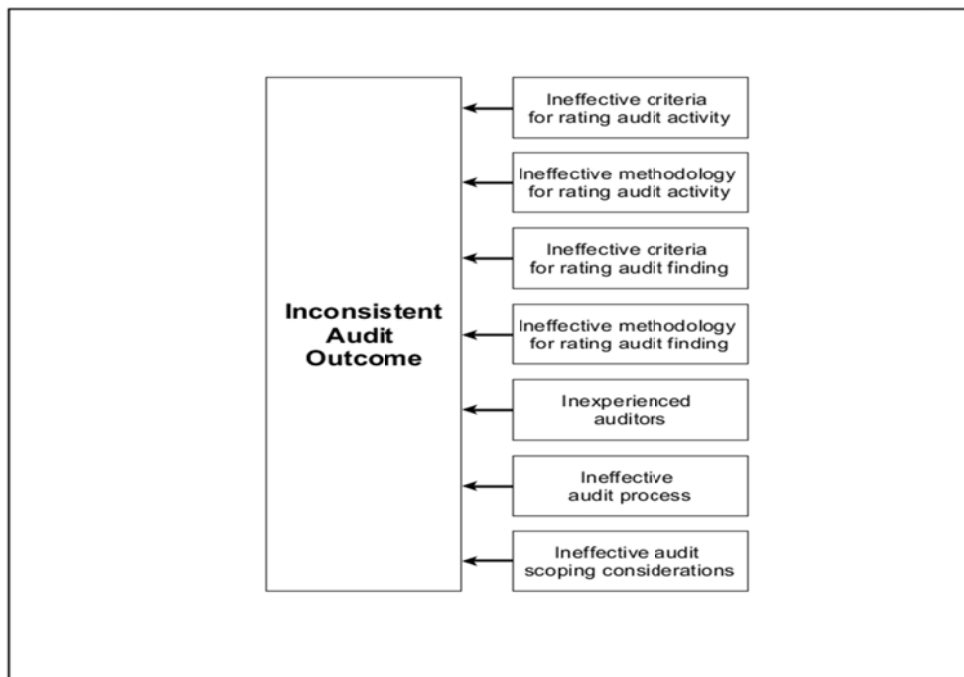


Figure 2.4: Potential causes for inconsistent audit outcomes

(Source: Own source)

The potential causes identified were:

- Ineffective criteria for rating audit activities.
- Ineffective methodology for rating audit activity.
- Ineffective criteria for rating audit findings.
- Ineffective methodology for rating audit findings.

- Inexperienced auditors.
- Ineffective audit process.
- Ineffective audit scoping considerations.

Assessing the potential causes, it is the opinion of the researcher, that the QA department currently consisting of auditors with varying technical backgrounds, may have been subjected to increased variability in audit outcomes due to shortcomings in the current criteria and methodology employed when rating audit findings. As a result, the following consequences have been observed within the QA department:

- Difficulty in defending the basis for choosing a particular audit rating and conclusion to the relevant stakeholders.
- Difficulty in consistently and objectively communicating the risk to the quality management system based on the severity of identified audit findings to the relevant stakeholders.

Since the purpose of the research study is: to explore and describe the practice amongst auditors when rating audit findings; identify reasons for inconsistencies and providing recommendations related to improving both the consistency amongst auditors when rating audit findings and the overall performance of the audit process, the potential benefits may be noted as follows:

- The level of objectivity amongst auditors when rating audit outcomes will improve.
- The communication related to the risk to the quality management system based on the severity of identified audit findings to the relevant stakeholders will improve.
- Observable consequences related to rating inconsistencies, such as limiting the need to defend the basis for choosing a particular audit rating and conclusion to the relevant stakeholders, will be addressed.
- Appropriately address an identified business need.

In addition, the need to further evaluate the area of rating audit findings was also noted as a recommendation from a previous study performed in this area by Smith, Bester and Moll (2013:102).

Since historical data for audit activities were readily available, an initial investigation was performed to determine the feasibility of the potential causes noted in Figure 2.4. As part of the evaluation, the following elements were reviewed:

- The practice used to determine audit activity ratings and conclusions.
- The relation, if any, between the audit finding ratings and the audit activity ratings.

2.9. EVALUATION OF PREVIOUS AUDIT DATA

An extensive evaluation of eighty-two activities for the period, 2008-2010 was performed. As part of the evaluation, both the ratings of audit activities and audit findings were considered. The data used as part of the evaluation was noted in Appendix 3. In addition, the activities rated as “met” were not considered as part of the sample since findings identified as part of these activities would not be of a nonconforming nature. Therefore only the following types of activities were reviewed and discussed in turn:

- Mostly met.
- Partly met.
- Not met.

2.9.1. Mostly met audits

According to the practice within the QA department, audits are rated “mostly met” when the criteria summarised in Appendix 2 (2.1-2.3) are met. A total of forty-four activities were rated as “mostly met” from the sample of historical data (Appendix 3). As part of the assessment, the percentage distribution of the different rated findings (low, medium or high) for each activity was represented in Figure 2.5. Note that none of the findings were rated high in these activities.

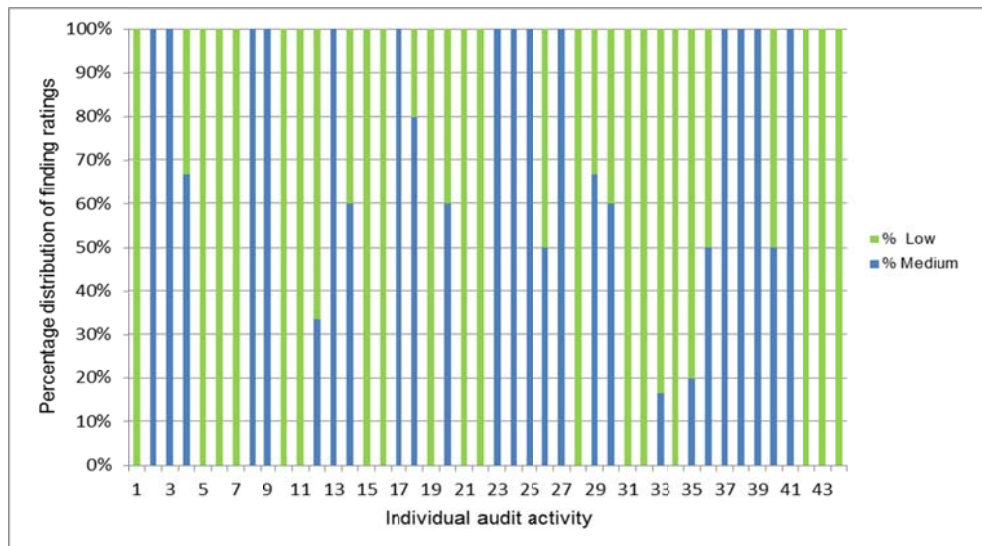


Figure 2.5: The distribution of nonconformity ratings for ‘mostly met’ audits.

(Source: Own source)

For these activities, the following were noted:

- The majority of audit findings were rated as either medium or low: A total of 32% of the activities only had medium rated findings; A total of 41% of the activities only had low rated findings.
- A total of 27% of the activities had a combination of medium and low rated findings. A variance in the distribution in these activities was noted. Even though variation in the distribution of audit finding ratings were noted for a number of activities, the activity ratings were supported by the criteria noted in Appendix 2 (2.1-2.3).
- None of the findings were rated high.

2.9.2. Partly met audits

Audit activities rated as a ‘partly met’ are expected to meet the criteria as tabulated in Appendix 2 (3.1-3.5). A total of thirty-three activities were rated as “partly met”. The distribution of the finding ratings for each activity is noted in Figure 2.6.

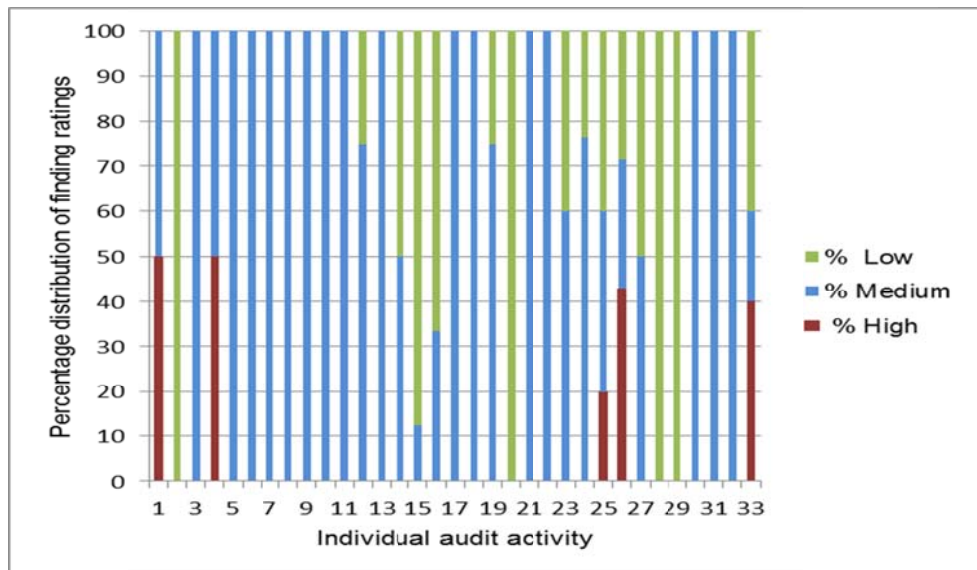


Figure 2.6: The distribution of nonconformity ratings for ‘partly met’ audits
(Source: Own Source)

For activities rated as “partly met” the following were noted:

- Instances where only low rated findings were raised were noted. Besides criteria Appendix 2 (3.1) possibly implying low rated findings, no mention of low rated findings is made as part of the criteria of a “partly met” activity. Instances such as these were noted in activity numbers 2, 20, 28, 29, representing 12% of the activities in this category.
- The largest proportion of the “partly met” activities (48%) only had medium rated findings.
- A smaller proportion (15%) of the activities had high rated findings as part of the findings noted.
- There were instances where both medium and low rated findings were present. Variation in the distribution of the ratings was noted, the variation included the following: 50/50; 75/25; 12/88; 33/67 splits respectively.
- Similarly, when high rated findings were present, there was variation in the distribution of the identified findings, noted in activity 1, 4, 25, 26 and 33.

2.9.3. Not met audits

For the audit activities rated as “not met”, fulfilment of the documented criteria in Appendix 2 (4.1-4.6) is required. A total of five activities were rated as “not met”. The distribution of the finding ratings for each “not met” activity has been represented in Figure 2.7.

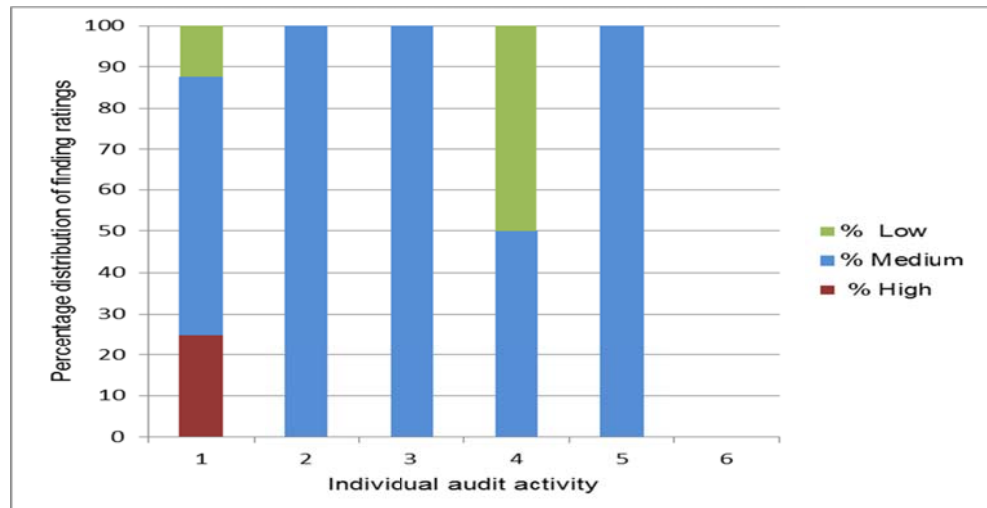


Figure 2.7: The distribution of nonconformity ratings for “not met” audits
(Source: Own Source)

For these activities, the following were noted:

- Instances were noted where findings were rated as low. Appendix 2 (4.1) may possibly imply low rated findings; however no mention of low rated findings is made as part of the criteria.
- There were instances where both medium and low rated findings were identified; however variation in the distribution of these ratings was noted.
- The majority of the “not met” activities (60%) only had medium rated nonconformities. This was concerning as a large proportion (48%) of the “partly met” activities also consisted only of medium rated findings making it difficult to distinguish between “partly met” and “not met” activities at this point in time (see paragraph 2.8.2).

2.10. CONCLUSION

In this chapter the context of the research study which included: the general background to the elements related to the nuclear power industry; the safe production of electricity; the role of the QA department within this setting; and the existing problem of inconsistent activity ratings by QA auditors in the identified environment, was provided.

In brief, the QA department currently consisting of auditors with varying technical backgrounds have encountered an increased level of variability in audit activity outcomes. The cause of such variability may be due to shortcomings in the current criteria and methodology used to rate both the audit activities as well as the audit findings. However since audit findings ultimately form the building blocks for rating the overall audit activity, intuitively it may be the best starting point in resolving the problem.

The next chapter will explore literature associated with the following topics: quality management system audits; quality related practices; and any relevant themes deemed pertinent to provide the theoretical framework within which to investigate and facilitate the resolution of the research problem.

CHAPTER 3: LITERATURE REVIEW - A DISSECTION OF THE QUALITY MANAGEMENT SYSTEM AUDIT

3.1. INTRODUCTION

“We cannot solve our problems with the same thinking we used when we created them.”

Albert Einstein (1879-1955)

The objective of this chapter is to explore the various theories and concepts related to Quality Management System (QMS) audits in order to provide the necessary context and insight needed to resolve the primary research question,

How will the audit process and the associated outcomes be affected by improving the consistency amongst auditors when rating individual audit findings?

A detailed dissection of the Quality Management System audit process will be executed, focusing on the following areas:

- The purpose of QMS audits.
- Audit process performance.
- Audit findings.
- Auditor role and performance.
- Risk-based process monitoring.

3.2. THE PURPOSE OF QMS AUDITS

The Organisation for Standardisation (2009:5) proposed the fundamental purpose of an audit activity as follows,

“Audits are used to determine the extent to which the quality management system requirements are fulfilled.”

Differently stated, QMS audits are used to assess an organisation's compliance to existing QMS requirements.

Rajendran and Devadasan (2005:365:**Online**) citing Karapetrovic and Willborn (2001:**Online**) averred that initially the purpose of QMS audits was merely for quality standard certification. However, the literature subsequently reviewed indicated that there was more to quality audits than mere compliance. It is this augmented role that will be discussed in the next section.

3.2.1. The evolution of the QMS audit

A study by Barthelemy and Zairi (1994:**Online**) unpacked the evolution of the QMS audit and noted the existence of the following types of QMS audits:

- The non-conformance audit.
- The continuous improvement audit.
- The thriving audit.
- The ultimate audit.
- The global audit.

Evaluating each audit type has revealed slight variation which has occurred over time. The following section briefly describes these variations and documents the evolution of the QMS audit depicted in Figure 3.1.

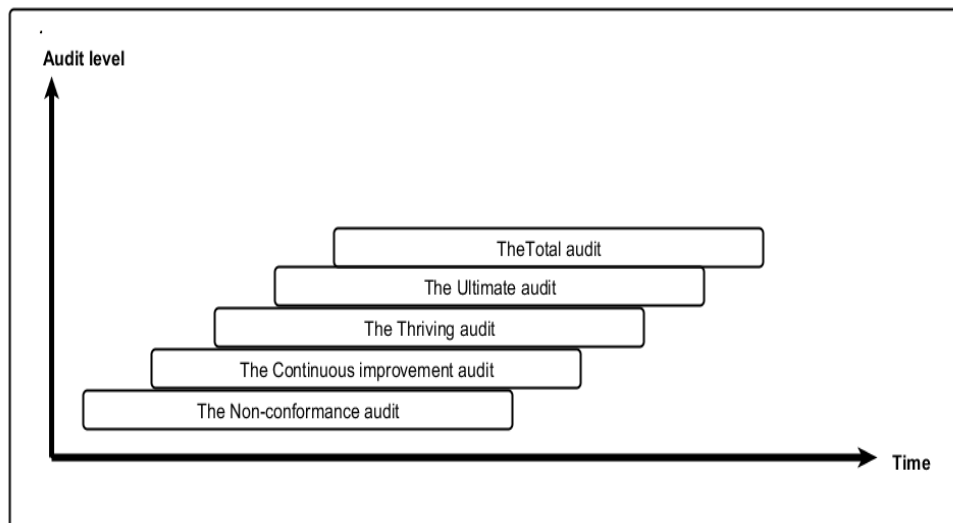


Figure 3.1: The evolution of quality auditing
(Source: Barthelemy and Zairi, 1994:46:**Online**)

The key aspects of each audit type have been summarised below:

- **The non-conformance audit:** This audit type is simply concerned with achieving and maintaining quality standard certification.
- **The continuous improvement audit:** In addition to verifying conformance, the purpose of this audit type is fostering enhancements. In order to implement this type of audit, a change in attitude by both auditee and auditor is required.
- **The thriving audit:** Compliance and improvement, with the addition of in-depth scope and objective considerations, is the aim of this audit.
- **The ultimate audit and the global audit:** These two audit types consider multiple standards and integrated management systems as part of the auditing activity.

The evolution of the QMS audit highlighted the various roles of the audit activity which will be discussed next:

- QMS audit as an assessment tool.
- QMS audit as a continuous improvement tool.
- QMS audit in monitoring processes.

In addition, the challenges associated with performing QMS audits will also be reviewed.

3.2.2. QMS audit as an assessment tool

As mentioned earlier, Rajendran and Devadasan (2005:365:**Online**), returned that QMS audits are fundamentally required for achieving Quality standard certification.

Similarly in an earlier study, Beecroft (1996:34:**Online**) returned the same opinion, but added to the purpose of the QMS audit in the following sense. Beecroft (1996:**Online**) returned that QMS audits are a necessity for any organisation who aimed to maintain an effective QMS, therefore highlighting the role of the QMS audit as an assessment tool.

Likewise Robitaille (2014:V&25) explained that the QMS audit has numerous assessment capabilities which include the following:

- Determining the level of control of specific processes.

- Determining the level of conformance to pre-defined requirements and standards.
- Determining the effectiveness of operational processes and the Quality Management System overall.
- Determining the need for corrective and preventive initiatives.

From these sources, it is apparent that mere compliance verification only represents the basic function of the QMS audit. However, in today's competitive world, this may no longer be sufficient. With this in mind, the additional roles and functions of an augmented audit and the associated benefits will be investigated and discussed in the sections that follow.

3.2.3. QMS audit as a continuous improvement tool

Beeler (1999) cited by Karapetrovic and Willborn (2001:366:**Online**) was of the opinion that continuous improvement initiatives were not driven by audits but were merely a positive derivative of an effectively executed audit.

An alternative opinion however is provided by Pyzdek and Keller (2013:**Online**) who returned that continuous improvement initiatives are brought about by audits. These authors believed that when audits are effectively executed, conditions are identified that if left unattended, may lead to future nonconformities.

In order for audits to be effective as part of continuous quality improvement (CQI), the following elements have been identified as necessary:

- **The role of management in CQI:** In order to fully benefit from audit activities, managers are required to acknowledge the value audit findings have to offer, and encourage employees to see audit findings in a positive light. The importance of management's attitude towards audit activities and audit findings is therefore seen as critical for continuous improvement to transpire (Pyzdek & Keller, 2013:**Online**).

The opinion noted by Pyzdek and Keller (2013:**Online**) directly links to the audit evolution study where the auditee's attitude was noted as critical in

the continuous improvement audit type noted by Barthelemy and Zairi (1994:**Online**).

➤ **The role of the auditor in CQI:** A study by Rajendran and Devadasan (2005:365:**Online**) citing Karapetrovic and Willborn (2001) highlighted that the possible benefits of continuous quality improvement (CQI) are generally not realised. This is mostly due to the lack of awareness by auditors in identifying opportunities for improvement which may include identifying defects that may not form part of the audit scope. In addition, Rajendran and Devadasan (2005:375:**Online**) citing Kondo (1998) indicated that when auditors pro-actively search for improvements to operational processes, CQI has an increased chance of being realised.

This argument had direct correlation to the audit evolution study where the auditor's attitude was critical in the continuous improvement audit type noted by Barthelemy and Zairi (1994:**Online**).

Finally, Rajendran and Devadasan (2005:365:**Online**) also asserted that while well executed audits have the potential to deliver benefits such as continuous quality improvement (CQI), the levels of improvement gained may not significantly be demonstrated by outstanding financial gains.

Besides the functions noted thus far, the audit activity may also be used extensively to monitor processes. This function will be discussed next.

3.2.4. QMS audits in monitoring processes

Organisations are fundamentally concerned with improved business performance and the resultant sustainability of the business. In order to achieve these outcomes, organisations usually establish a vision, mission, core values, goals for the organisation and finally practicable objectives that will ensure the vision and mission of the organisation can be achieved (Tummala & Leung, 1996:**Online**).

In order to achieve practicable objectives, the organisation will usually strive to improve operational processes by eliminating recurring defects and faults within in the business and operational processes.

According to Das, Maiti and Banerjee (2012:720:**Online**), process monitoring provides a vehicle for uncovering defects and faults, which potentially leads to improved product quality; process control and process improvement.

Further to CQI, audits have also been known to identify potential risks to operational and business processes. Therefore if QMS audits are executed effectively in a proactive manner and perceived in a positive light by the auditee, the QMS audit can potentially stimulate all kinds of business improvements and ensure an organisation's position in the market. However poorly executed internal QMS audits have the potential to be destructive to the very organisations that depend on gaining the recognised benefits from these audit activities. Such challenges will be further evaluated in the following section (Beecroft, 1996:32-34:**Online**).

3.2.5. Challenges associated with performing QMS audits

Beecroft (1996:**Online**) noted the following challenges facing permanently employed auditors when executing quality audits:

- Lack of ownership related to the quality management system and associated matters by all levels in an organisation.
- The perception that members of the audit department are considered enemies.

In addition, Beecroft (1996:32-34:**Online**) supported the view that QMS audits are closely associated with an effectively implemented QMS, but also acknowledged that QMS audits are generally challenged to meet the pre-determined objectives. In order to evaluate the identified challenges associated with audits, the following areas will be reviewed:

- Inherent risk of the audit process.
- Auditee perception.
- Audit execution and audit reports.
- Auditor competency.

3.2.5.1 Inherent risk of the QMS audit process

Beckmerhagen *et al.* (2004:18:**Online**) related risk in terms of the audit process and audit effectiveness as follows,

“[Risk] depends on a particular audit failure, and can be formulated as a function of severity (consequence), and probability of detection and occurrence of an audit”

This definition speaks directly to the inherent risk residing within the audit process when executed. Stated differently, when audits are not effectively executed, for whatever reason, the risk to the organisation at an operational level is increased. The reason for the increased risk to the organisation is due to the fact that the audit is unable to achieve the predetermined objectives of identifying significant nonconformities within business processes. In addition when inherent audit risks are realised, the situation not only adds risk to the business processes where a nonconformity may be residing but also adds risk to the actual nonconformity as it remains unresolved for an extended period of time. Therefore, if the audit fails to deliver on its objectives, the organisation is impacted on at various levels, both operationally and organisationally (Beckmerhagen *et al.*, 2004:18:**Online**).

Beckmerhagen *et al.* (2004:20-23:**Online**) continued by highlighting that various aspects of the audit process and the associated resources may all contribute to the inherent audit risk and may therefore impact on the audit effectiveness. Aspects identified include the following:

- Auditor qualification and experience.
- Audit objectives.
- Audit criteria.
- Timing of audits.
- Auditing methods.

An earlier study by Colbert and Alderman (1995:38:**Online**) which dealt with analysing a risk-driven approach to auditing, shared similar views related to the inherent risk of the audit process including the risk of non-detection of anomalies.

In order to counter the shortcomings in the noted areas, Beckmerhagen *et al.* (2004:23-24:**Online**) returned that by considering adjustments to the audit process, an organisation can improve the opportunity of identifying risks and ensuring the successful execution of audits. Similar views were once again previously noted by Colbert and Alderman (1995:**Online**).

Besides understanding the inherent risk of the QMS audit process, aspects of auditee perception will be discussed next.

3.2.5.2 Auditee perception

Elliot, Dawson and Edwards (2007:552 & 562:**Online**) returned that audits may be seen in a negative light. The authors continued by determining that the negative connotations were not necessarily based on the method of execution by specific auditors but rather due to the perception held by various role players. Part of the negative perception expressed by managers and auditees may be due to their individual viewpoint that audits are mandatory exercises with very little or no positive benefits. In addition, QMS audits are considered punitive exercises within organisations especially where audit findings are considered to be: unreliable and/or of no value to the organisation.

Since audit activities may be challenged in identifying audit findings that are considered to be value adding and reliable, an investigation of the elements that may potentially influence the value and reliability of the QMS audit was also deemed crucial for this research study. These elements are related to the execution of the audit process and will be discussed within that context.

3.2.5.3 Audit execution and reports

Robitaille (2014:7&53) alluded to the challenges linked to the quality of the audit reports generated as an output of the execution phase of the monitoring process. This source shared that besides capturing the actual conditions noted during an audit, audit reports also provide an account of an auditor's thoughts as well his/her articulations of perceived risk as

noted during the audit activity. In so doing, audit reports should be seen as forewarning that requires attention by the relevant stakeholders.

In instances where processes have failed as a result of process gaps, quality audit reports normally come under scrutiny. If these process gaps were not identified during the audit process and/or not documented in the associated audit reports, it may seem as if the monitoring of processes has failed. This ultimately reflects poorly on the audit process and the competency of the auditor. It is therefore important that not only apparent nonconformities are identified but also potential gaps are noted in operational and business processes (Robitaille, 2014:7&53).

Linked to the effective execution of the audit process and producing effective audit reports, the level of auditor competency may also challenge audit process outputs. This area will be reviewed briefly in the next section.

3.2.5.4 Auditor competency

The information gathered as part of the literature study thus far, has also implied the importance of the role of the QMS auditor and the associated challenges that may affect the level of competency of such role players. According to the literature reviewed, it is expected that auditors provide unbiased information to the organisation's top management, who will ultimately make decisions related to strategy and resource allocation based on audit findings (Robitaille 2014:26).

Besides providing unbiased information, Pyzdek and Keller (2014:**Online**) highlighted the role of the auditor in resolving audit findings. The study suggested that the role of the auditor may include the provision of quality-based advice which may possibly result in the resolution of the noted anomalies. When specific mind-sets and attributes required of an auditor are absent though, these individuals may be challenged to execute audits of a high quality, leading to auditee frustration and management dissatisfaction.

A closer look at the elements deemed critical for the effective execution of process monitoring as part of the audit process as well as the competencies needed of auditors, will be discussed in following sections.

3.3. AUDIT PROCESS PERFORMANCE

Beckmerhagen, *et.al.* (2004:15:**Online**), considered the QMS audit as a system/process used to achieve pre-determined objectives. The literature reviewed seemed to predominantly deal with the effectiveness of audit program management but not the audit activity per se. In an attempt to address the lack of information related to effectiveness of the audit activity, a number of studies were reviewed and discussed in the following sections:

- Audit programme effectiveness.
- Audit quality.
- Audit effectiveness.
- Elements affecting audit effectiveness.

3.3.1. Audit programme effectiveness

Quality and audit standards require organisations that have an established QMS, to establish and execute an audit programme (ISO, 2008:12:**Online**). These standards simply provide direction on how to establish and assess the effectiveness of the auditing programme, and have provided limited guidance on how to improve the actual audit activity. Due to this shortcoming, organisations that merely adhere to these standards are not assured of effective audit execution and the associated benefits.

The lack of insight noted in these quality and audit standards, guiding auditing activities, along with the fact that auditing is essentially a self-regulated profession, creates opportunities for inconsistency to arise amongst quality auditors in all types of industries (Beckmerhagen *et al.*, 2004:15:**Online**).

In addition Beckmerhagen *et al.* (2004:15:**Online**) returned that effective audits are important in all industries but are particularly critical in high risk

organisations where non-compliance are associated with unacceptable risks. The study also alluded to the fact that in order to understand and define the concept of “*audit effectiveness*”, an evaluation of the whole audit process as noted in Figure 3.2, will be required.

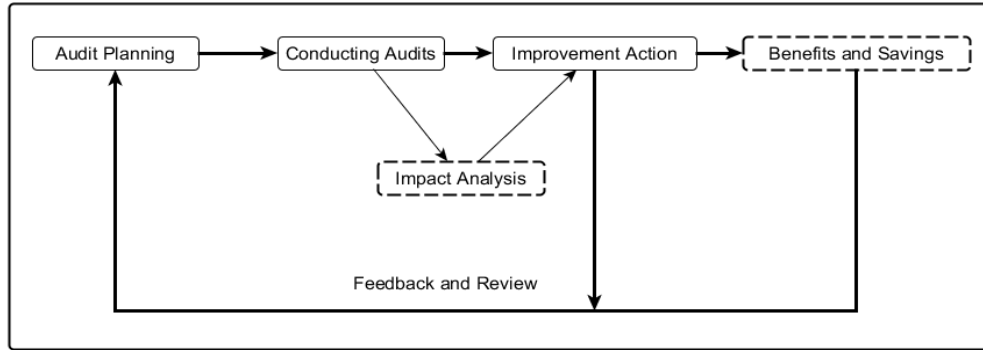


Figure 3.2: High level audit process map

(Source: Elliot, Dawson & Edwards, 2007:562:Online)

Before embarking on investigating the concept of audit effectiveness and the elements affecting audit effectiveness, the concept of audit quality will first be interrogated.

3.3.2. Audit quality

The concept of audit quality was initially reviewed in order to contextualise the concept of audit effectiveness. A study by Duff (2009:401-402:Online) dealing with the quality of finance auditing, broke down the concept of audit quality and the various elements that influence audit quality. The model noted in the study has been depicted in Figure 3.3 below.

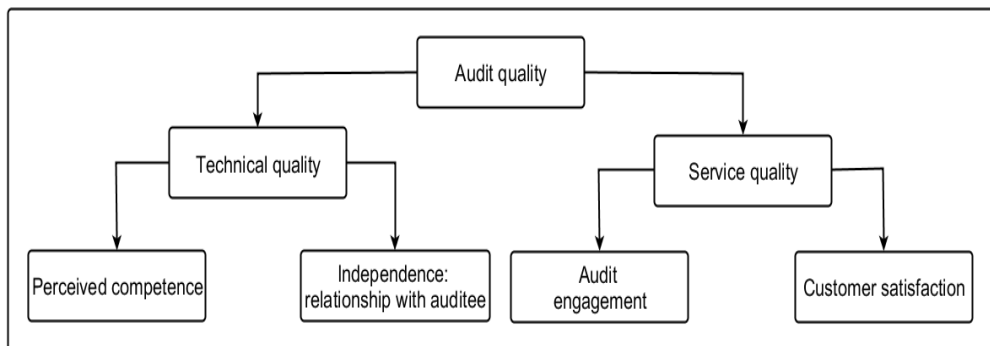


Figure 3.3: The Four factor model

(Source: Duff, 2009:402:Online)

Generally, the model identified service quality and technical quality as components of audit quality. Each high level category has specific variables to be considered, which are noted as follows:

- **Service quality:** Related to providing stakeholders with what they want and what they need, and broadly speaking deals with customer satisfaction.
- **Technical quality:** Linked to auditor competence and the degree of independence exercised by the auditor.

These elements broadly speaking make up the “Four-factor model” and formed an input to defining the concept of audit effectiveness.

3.3.3. Audit effectiveness

Now that the concept of audit quality has been considered, the model may provide the necessary insight needed to evaluate audit effectiveness in the quality environment. As a starting point, a study by Elliot, Dawson and Edwards (2007:**Online**) compared the concepts of audit quality and audit effectiveness which are discussed in the sections that follow.

3.3.3.1 Service quality

Elliot, Dawson and Edwards (2007:556:**Online**) proposed that the elements noted below may contribute to audit effectiveness:

- **Audit objectives:** Need to be well defined and effectively communicated to the audit team.
- **Reporting time:** The time taken to produce reports is adhered to.
- **Critical success factors:** Determining indicators of the audit programme and the audit activity that may be linked to financial value.

Elliot, Dawson and Edwards (2007:552-554:**Online**) recommended that cognisance be taken of the following information when evaluating audit effectiveness:

- **Audit scope:** Shortcomings in the scope considerations may negatively impact on the QMS audit efficacy.
- **Effectiveness reviews:** Not considering the results from previous audits may also negatively impact on QMS audit efficacy.

These views were also shared by Robitaille (2014:72), who returned that actions such as effectiveness reviews can provide evidence of management system improvement as well as be an indicator of the value that process audits deliver.

Beckmerhagen *et al.* (2004) as cited by Elliot, Dawson and Edwards (2007:555:**Online**) also proposed that audits be deemed effective when QMS audits are able to firstly, detect shortcomings and secondly, effect operational improvement within the specific industry. Further suggesting that the definition for audit effectiveness include considerations such as the following:

- Overall client satisfaction.
- The reliability of audit findings.
- Audit findings which are value adding.

Now when compared to the study performed by Duff (2009:**Online**), similarities were noted between the elements identified as part of service quality and the elements noted for audit effectiveness.

3.3.3.2 Technical quality

According to Robitaille (2014:47), auditor competence is by far the most crucial element needed for the execution of an effective audit. Elliot, Dawson and Edwards (2007:**Online**) also indicated that when audits are performed by less than competent auditors who are firstly unaware of the risk impact of a particular process on the organisation; who accept shortcomings in the scoping of audits performed or who fail to consider previously raised nonconformities, these all add to the ineffectiveness of an audit activity. These audits are therefore executed by auditors who are unaware of the relevant risk to processes.

Once again when compared to the study by Duff (2009:**Online**), similarities were noted between the concept of technical quality and the elements of audit effectiveness. Collectively these similarities between audit quality, which comprises service and technical quality, and the

concept of audit effectiveness were noted and has led to the Four factor model being adopted as the framework for the rest of the study.

3.3.4. Elements affecting audit effectiveness

Robitaille (2014:14) alluded to factors, predominantly related to planning that may impact the efficacy of an audit. The author also provides nine steps to successful audits, which include steps from planning and preparing for the activity right up till reporting back to management (Robitaille, 2014:76)

Mohamed and Habib (2013:119:**Online**) conversely were of the opinion that audit quality hinges on highly independent auditors who are confident in sharing all aspects of the audit findings. The authors, citing numerous sources, also indicated that the following elements were deemed to impact audit quality: audit reports; auditor reputation; and auditor experience (Jackson et al. (2008); Lennox (1998); Geiger & Raghunandan (2002); Meyer et al. (2007); Lowensohn et al. (2007); Knechel et al. (2007); Roberts et al. (1990); Gul et al. (2007); Ghosh & Pawlewicz (2008); Davidson et al.(2005).

Alternatively, Elliot, Dawson and Edwards (2007:555:**Online**) citing Beckmerhagen *et al.* (2004) considered the complete audit system and identified a wide range of components presumed to impact the efficacy of an audit. Based on this notion, an understanding of the full range of elements that impact the effectiveness of the QMS audit, from the planning phase to ultimately the effective resolution of nonconformities, were considered as part of the literature study. Since all aspects of the audit system may therefore impact the execution of the audit activity, it was deemed necessary to consider all aspects of the process in order to measure the effectiveness of the audit activity. By inference therefore the measurement of audit effectiveness would involve a complex definition (Beckmerhagen *et al.* 2004:17-18:**Online**). The aspects identified by these two sources have been quoted verbatim in Table 3.1 for ease of reference.

Table 3.1: Components of an effective audit

(Source: Beckmerhagen *et al.* 2004:17-18:Online and Elliot, Dawson & Edwards, 2007:555:Online)

	Beckmerhagen et al. 2004:17-18	Elliot, Dawson & Edwards, 2007:555
1	Defining adequate and feasible audit objectives, which are approved by all interested parties	Has adequately defined audit objectives, approved by all stakeholders
2	Preparing a suitable audit plan, which is accepted by all interested parties	Has a suitable plan accepted by all
3	Providing adequate resources and time to complete the audit	Allows for adequate resources; people and time.
4	Planning and executing the audit by properly appointed and competent auditor. Appointments has to be done by audit management, acknowledged by the client, and the audit assignment must be accepted by the auditor	Is executed by component auditors.
5	Conducting the audit in accordance with recognised audit standards and procedures	Is conducted in accordance with a standard or procedure
6	Finding valid nonconformances. "Valid" in this context means that the findings are of sufficient importance and are confirmed without reasonable doubt. In case of such a doubt, consultation with a competent peer auditor is advised	Has findings that are valid and significant to record which are analysed against objectives and risk and that lead to improvements
7	Recognising and adequately analyzing the findings in connection with the audit objectives, with an emphasis on risk management	
8	Fostering corrective and preventive actions and improvements. Audit results must lead to corrections and improvements	Provide evidence of improved working practices
9	Satisfying the client completely in terms of achievement of stated objectives and the auditor's performance in general	Has satisfied clients
10	Providing objective evidence to all interested parties that the audit resulted in improvement of the quality management system	

An evaluation of the factors identified in Table 3.1, suggested a considerable portion of the elements identified were associated with audit findings.

In support, Elliot, Dawson and Edwards (2007:**Online**) emphasised that the focus of evaluating audit effectiveness should probably shift from programme and schedule adherence, to tracking actual benefits such improvement initiatives as well as saving and/or reducing wastage which all stems from effective audit findings.

An alternative view was offered by Firescu (2014:51:**Online**) who returned that various elements listed below, specifically related to the auditor and associated attributes, may impact on the performance of an audit:

- Responsibility.
- Integrity.
- Objectivity.
- Independence.
- Value added.
- Competence.
- Rigour.
- Perseverance.
- Clarity of communication.

For this reason, the literature study will continue to focus in the area of the audit findings and auditor performance in order to elaborate on the efficacy of the audit process.

3.4. AUDIT FINDINGS

The Organisation for Standardisation (2009:9) provided the fundamental purpose of an audit finding,

“Audit findings are used to assess the effectiveness of the quality management system and to identify opportunities for improvement”.

However, formulating and articulating an audit finding that satisfies the stated purpose noted above may be more challenging than anticipated. Beckmerhagen *et al.* (2004) and Walleans (2000) both cited by Elliot, Dawson and Edwards (2007:556:**Online**), highlighted challenges that are related to formulating audit findings. According to these authors, audit findings need to be valid and significant in order to justify the recording of

such a finding and warranting action to address the finding. Furthermore, the authors highlighted that when audit findings are considered petty and unimportant by the auditees, these negatively impact on the effectiveness of the audit outcome.

Reviewing the literature, it seemed plausible that the effectiveness of audits may hinge on all the factors mentioned above as well as the perception of the auditee. However, since audit findings largely impact audit effectiveness, this topic will be further evaluated in the following sections:

- Valid audit findings.
- Significant audit findings.
- Reliable audit findings.
- Auditee perception.

Besides the key areas noted above, the role of the auditor will also be reviewed.

3.4.1. Valid audit findings

Formulated audit findings and the resolution of the identified anomalies (including: correction, corrective and preventive actions) are considered the end products and the tangible outputs of the QMS audit process. These outputs may be evaluated by both the auditee and the auditor, in order to determine whether the audit activity was successful. The success of an audit may therefore be based on a number of aspects which include: identifying audit findings that make a difference; and identifying actions that reflect robust resolution of anomalies (Robitaille, 2014: 76). Establishing the characteristics that impact on the validity of audit findings will be discussed next.

According to Beckmerhagen *et al.* (2004:18:**Online**) valid audit findings are defined as follows,

“The findings are of sufficient importance and are confirmed without reasonable doubt”.

It is acknowledged that in order for findings to be considered as valid, the findings are to be: correct; complete; and be considered statements of truth. In addition, valid audit findings should lead to important risk identification and/or meaningful improvements and could present a financial benefit, either as a profit or a means of saving cost. Findings are therefore valid and possibly value-adding when changes are brought about which are perceived to be beneficial by the auditee (Robitaille, 2014:59).

3.4.2. Significant audit findings

According to Beckmerhagen *et al.* (2004:18:**Online**), significance in terms of audit findings, is particularly concerned with risk identification and risk management as stated below,

“Recognising and adequately analyzing the findings in connection with the audit objectives with an emphasis on risk management”.

The authors returned that audit findings are considered significant when risks are identified and when significant changes are brought about with only a few audit findings. Significant findings are therefore findings that are considered critical and essential and may materially impact on the performance and possibly the safety aspects of an organisation. Identifying significant audit findings is especially important when providing assurance of compliance to operational and safety standards in high risk industries where resources are required to be assigned effectively and efficiently (Beckmerhagen *et al.*,2004:18:**Online**).

Besides the need for significant audit findings, literature has identified the need for reliable audit findings. Aspects that impact on the reliability of audit findings will be discussed next.

3.4.3. Reliable audit findings

Elliot, Dawson and Edwards (2007:555:**Online**) returned that the aspect of reliability seems to be as much dependent on: auditor performance; perceived auditor competence; and auditee perception related to a specific audit finding being raised. Therefore the ability of the audit finding to add

value to the organisation's performance as well as the ability of the auditor to effectively identify risk during the audit process, are also aspects that contribute to the definition of reliability in the context of the audit activity and specifically the audit finding.

In summary, favourable attributes of audit findings, according to the sources reviewed, are as follows:

- **Valid:** Indicating correct, complete and statements of truth.
- **Significant:** Able to identify risk.
- **Reliable:** Related to auditor competence and performance.

Aspects of auditee perception as related to audit findings will be discussed next.

3.4.4. Auditee perception

The effectiveness of audits seems to be influenced by valid, reliable and significant audit findings, as noted in the previous section. Similarly, related to audit effectiveness, is the aspect of auditee perception. By determining and understanding the auditee's expectations related to the audit process, auditors and auditing organisations may be able to improve audit efficacy as perceived by the auditee.

In order to better understand auditee perception, the following themes will be discussed:

- Auditee perception related to audit execution and audit findings.
- The attitude and support of management.
- The role of marketing and communication.

3.4.4.1 Auditee perception related to audit execution and audit findings

Auditor performance during audit execution may significantly influence the audit quality and the overall audit effectiveness (Fadzil, Haron & Jantan, 2005:845:Online). However, when auditee's are not provided with a quality product, meaning acceptable audit execution and related audit

findings that meet expectations, audit effectiveness may be judged to be sub-standard.

In particular, Elliot, Dawson and Edwards (2007:555:**Online**) asserted that when evaluating audit effectiveness from an auditee's point of view, the following are usually considered important:

- Audit activities performed should be seen to be adding value to the organisation.
- Findings and associated actions for resolution (corrective actions, preventive actions and improvement actions) should be seen to be adding value.

In addition, Elliot, Dawson and Edwards (2007:**Online**) also expanded on the topic of auditee perception by highlighting elements that can sway an auditee's perception in a negative way. These are as follows:

- The execution of audits is considered to be inefficient.
- Audit activities are considered to be insignificant.
- Audit findings are considered trivial.
- Root cause analyses do not lead to resolution of findings leading to recurrences.

When audit activities and associated audit findings are perceived as insignificant, inefficient, and adding no value, it becomes nearly impossible to lobby the positive attitude and support of management.

3.4.4.2 The attitude and support of management

Beecroft (1996:33:**Online**) supported the previous viewpoints and returned that management play a crucial role in promoting the reputation of the QMS audit. The positive endorsement however will only occur if managers themselves believe that audits have noted benefits such as identifying significant, value-adding concerns and addressing findings in a manner that eliminates recurrences. Beecroft (1996:34:**Online**) highlighted that when it comes to evaluating findings and associated risks, auditors should endeavour to prioritise findings which identify the most significant risks. The study warned that when too many nonconformities are raised or too many opportunities for improvement are noted, the

possibility of success in fixing problems effectively are reduced, which may challenge managers to see the audit in a positive light. This viewpoint was supported by Beckmerhagen *et al.* (2004:**Online**).

Furthermore Beecroft (1996:**Online**) continued by stating that auditees should be encouraged by managers to view audits and audit findings as opportunities to identify strengths and seek improvements. These sentiments were also echoed by Robitaille (2014:22). It is acknowledged that managers would only support endeavours they believed were worth supporting and therefore it is the auditor's responsibility to promote the worth of these audit activities and all the related products related to this process.

3.4.4.3 The role of marketing and communication

Promoting the need to gain auditee support, was also highlighted by Elliot, Dawson and Edwards (2007:555:**Online**) citing Roth (2000). This source highlighted that successful audit departments valued communication and marketing as part of its daily operations. The study further urged auditing departments to adopt these functions, as far reaching benefits will be reaped by both the auditing department and the organisation as a whole.

Rajendran and Devadasan (2005:372:**Online**) supported the notion of communication and marketing as noted above and highlighted the need to identify the expectations of the audit customer. The use of surveys were provided as a means by which to solicit the necessary feedback from auditees, which could include both determining the auditee expectations as well as determining the auditee's current perception of audit quality and audit effectiveness. The authors acknowledged that although the surveys are not easily executed and may not be performed often, such evaluations could harvest valuable information only retrievable from stakeholders/customers.

From the areas noted, it is apparent that determining the perception of the auditee would require a holistic approach, an approach that would include items such as technical and service quality previously mentioned. A key consideration in meeting auditee expectations would be to provide the

auditee with audit findings that are deemed valid and significant. As part of delivering audit findings that are deemed valid and significant, is the role played by the auditor. It is this area that will be considered next.

3.5. AUDITOR ROLE AND PERFORMANCE

The International Organisation of Standardisation (2011:24) averred that effective audits are not possible without the involvement of competent auditors. Likewise, the information gathered thus far has alluded to the importance of the QMS auditor function as part of quality audit process. In the section that follows the function of the QMS auditor will be scrutinised to corroborate this statement. The following sections will be reviewed:

- The role of the QMS auditor.
- Key auditor attributes.
- Auditor competency.

3.5.1. The role of the QMS auditor

Despite the perception that auditors fulfil the role of “organisational watchdog” (Romero, 2010:304:**Online**), various sources of literature support the notion that internal auditors provide tangible benefits as part of monitoring processes (Fadzil, Haron & Jantan, 2005:845:**Online**). These benefits have been noted in the area of:

- Process monitoring and performance improvement.
- Risk management.
- As well as an advisory role to management.

Each role is briefly discussed in the subsequent sections.

3.5.1.1 Role in monitoring processes

Firstly a study by Keogh (1994:23:**Online**) as well as Deribe and Regasa (2014:86:**Online**) were dissected. In particular, the study by Keogh (1994:23:**Online**) discussed the role of the quality assurance practitioner. As part of the monitoring process, the quality assurance practitioner has been identified as a central role player in detecting defects and faults within business processes in order to correct and improve performance.

Similarly, Rajendran and Devadasan (2005:273:**Online**) citing Beckmerhagen *et al.* (2003) highlighted the benefits available to an organisation when audits are executed by auditors who possess certain expertise. These benefits included:

- Aiding management in controlling interfaces.
- Improvement in process control.
- Continuous quality improvement (CQI).

3.5.1.2 Role in risk management

In comparison, Deribe and Regasa (2014:86:**Online**) unpacked the role of the internal audit function. This function was noted as being pivotal in monitoring risks and providing assurance regarding process controls.

When comparing the title of “*quality audit function*” as noted by Deribe and Regasa (2014:**Online**) and “*quality practitioner*” as referred to by Keogh (1994:**Online**), similarities were noted that made it reasonable to deduce that these titles and associated functions could be used interchangeably. Therefore it is inferred that auditors play a role in both risk management and process improvement.

3.5.1.3 Advisory Role

The internal audit function has been noted as performing an advisory role to support process improvement initiatives (Deribe & Regasa, 2014:86:**Online**). The opinion that internal auditing practices provide an advisory role is also returned by Fadzil, Haron and Jantan (2005:845:**Online**), in their study relating to internal auditing practices.

Likewise, Vanasco (1996:10:**Online**) citing the Institute of Internal Auditors (1957) corroborated that the auditing function is considered a managerial function, associated with tasks that measure and evaluate the effectiveness of business process controls and require a certain level of skill in order to be executed.

Collectively from these studies it was deduced that auditors fulfil the following roles which are echoed by Robitaille (2014:iii):

- Identify defects and faults as part of process monitoring.
- Continuously seek to improve value adding processes, products and service.
- Provide confirmation of assurance.
- Provide insight to processes at an operational level.
- Identifying risk and uncertainties in order to influence decision making processes.

From the literature reviewed, it can be deduced that auditors fulfil a crucial role in business management. And associated with that role and function, auditors require certain attributes. These attributes are discussed next.

3.5.2. Key auditor attributes

There seems to be a fundamental responsibility associated with the role of the auditor. This noted responsibility is supported by Robitaille (2014:26) who referred to this accountability as a “significant responsibility”. This responsibility involved auditors providing unbiased information to the organisation’s top management who will potentially make decisions related to strategy and resource allocation based on the identified audit findings (Robitaille, 2014:70). Consequently, in order to effectively execute the “significant responsibility” referred to, auditors are required to possess specific skill sets, competencies and mind-sets including the attributes of:

- Auditor independence.
- Auditor objectivity.

These two specific concepts will be clarified in the subsequent sections.

3.5.3. Auditor independence

So what is auditor independence and what is needed to achieve this quality? The Institute for internal auditors (n.d.:**Online**) provided the following definition for independence,

“Independence is the freedom from conditions that threaten the ability of the internal audit activity to carry out internal audit responsibilities in an unbiased manner...”

A study by Law (2008:919:**Online**) returned that auditor independence is linked to auditor credibility and is therefore able to influence: the audit output; the related audit activity; the reputation of the auditor; and auditee perception.

Similarly Mohamed and Habib (2013:117:**Online**), citing Nichols and Price (1976); and Lu (2005), provided the following insight related to auditor independence. According to this source, auditor independence is a fundamental requirement of the auditing vocation and is identifiable by the professional and ethical behaviour of an auditor when confronted by criticism from the auditees.

Further, Mohamed and Habib (2013:117:**Online**) citing Cameran *et al.* (2005) indicated that integrity, objectivity and professional judgement all contribute to auditor independence. The study also indicated that apart from the attributes required of the auditor, auditor independence is strongly linked to public perception of audit execution and auditor performance. This links to a previously mentioned study by Karapetrovic and Willborn (2001:369:**Online**), which also highlighted the concept of auditor independence and auditee perception as a fundamental principle of the auditing process.

Collectively all the studies examined thus far regarded auditor independence as imperative to the success of the audit process. To support this conclusion, the study by Vanasco (1996:**Online**) clearly presented existing theories related to auditor independence. For the benefit of the literature study, only the salient points of the different theories have been noted in Table 3.2.

Table 3.2: Theories related to auditor independence

(Source: Vanasco, 1996:Online)

	Salient Points
Mautz & Sharaf (1964)	Three facets of auditor independence were identified which potentially minimises the risk to auditor objectivity . These facets are: programming independence; investigative independence; reporting independence. These aspects in summary deal with the autonomy by the auditor from management when scheduling, executing and reporting as part of the audit programme.
Carey & Doherty (1966)	This study focused on internal and external associations between the auditor and the auditee . Firstly, each auditor has the responsibility to be honest, ethical and objective at all times. Secondly the authors speak of autonomy as related to the auditors' opinion and interaction with the auditee when expressing his/her opinion. Thirdly the authors indicate that an auditor should avoid engaging parties/auditees in a manner that may be construed as a conflict of interest.
Barrett (1969)	According to this author, auditor independence can be grouped by Interpersonal independence and Intrapersonal independence. The first construct is related to the perception of others of an auditor's independence. The second construct dealt with the intrinsic strengths and motivators of the auditor, which would be evident in the behaviour of the auditor .
Knapp (1985)	The study by Knapp evaluated aspects that influenced an auditee's perception of an auditor's autonomy . These aspects included financial and reporting relations in particular.
Sawyer (1988)	According to this study auditor independence was divided into: practitioner independence and professional independence. Practitioner independence refers to the organisational position and reporting position of the auditing group. In this context, optimum positioning allows for improved objectivity when formulating audit findings and reports. Secondly, professional independence refers to the external perception that auditors are behaving without bias .
Pasewark & Wilkerson (1989)	These authors returned, the relationship between auditor and auditee as well as the organisational positioning of the auditing group may impact on auditor independence. As part of this study, the authors refer to different power relations between auditor and auditee that may potentially influence auditor independence. These powers include: authoritative; expertise; coercive; personal and control power over rewards. Awareness of such powers according to the study provides an auditor with the necessary insight to guard against subjectivity .

Each theory highlighted certain key concepts linked to auditor independence; these have been highlighted both in the table and have been listed below:

- Associations between the auditor and the auditee.
- Perception of others, including the auditee's perception.
- Behaviour of the auditor.
- Auditor objectivity.
- Organisational position.
- Perception that auditors are behaving without bias.

From the salient points highlighted, it was noted that distinct links existed between the concepts of independence and objectivity. A study by Karapetrovic and Willborn (2000:680:**Online**), also elaborated on the relation between the concepts of independence and objectivity. The study returned that the two concepts were related but distinguishable, providing the following definitions for each concept,

“Independence refers to both the auditor’s organisational position and state of mind”.

“Objectivity is related to the consistency of the auditing methodology, process and outputs and is being free from bias”.

Until now the literature study has focused on auditor independence as part of the auditing process. Henceforth, the study will dissect the elements of auditor objectivity in order to shed light on this concept as well as compliment the understanding of auditor independence.

3.5.4. Auditor objectivity

The Institute for internal auditors (n.d.:**Online**) provided the following definition for objectivity,

“Objectivity is an unbiased mental attitude that allows internal auditors to perform engagements in such a manner that they believe in their work product and that no quality compromises are made. Objectivity requires that internal auditors do not subordinate their judgement on audit matters to others. Threats to objectivity must be

managed at the individual auditor, engagement, functional, and organizational levels.”

Vanasco (1996:10:**Online**) citing The Institute for internal auditors (1964) referred to the same definition in his study. In the study, the author highlighted the key concepts of objectivity as:

- Independent mental attitude of an auditor.
- As well as the organisational position and status of the auditing group.

In order to understand the concept of auditor objectivity, the study continued by dissecting the elements comprising auditor objectivity, paying particular attention to: the organisational positioning of the auditor; the auditor’s mental attitude; as well as the concept of psychological bias.

3.5.4.1 Organisational position

The element of organisational position has previously been referred to as part of the definition for independence (Karapetrovic & Willborn, 2000:680:**Online**).

Similarly, Vanasco (1996:9:**Online**), citing Gupta (1991) noted that auditor independence was also dependent on the reporting lines of the auditing group. The same source highlighted that when auditors lacked stature in the wider organisation, a tendency of ineffective advisory capability by the auditors were noted. Furthermore, the study concluded that when auditors reported to higher ranked functions within the organisations and enjoyed senior management support, both the auditor’s independence and stature improved (Vanasco, 1996:10:**Online** citing the institute for internal auditors, 1978).

Given that organisational position is related to both auditor independence as well as auditor objectivity, it can be concluded that auditor independence and auditor objectivity are linked and interdependent. And since independence is related to an auditor’s mental attitude as well, it would be prudent to evaluate this aspect in relation to auditor objectivity (Karapetrovic & Willborn, 2000:680:**Online**).

3.5.4.2 Auditor's mental attitude

Since auditors are generally not able to control or change: their organisational position; and the existing organisational culture they are exposed to, auditors remain challenged to maintain their independence. Objectivity however can be achieved through a number of methodologies (Karapetrovic & Willborn, 2001:369:**Online**).

In order to identify these methodologies, it was deemed necessary to re-visit the definition for objectivity (Institute for internal auditors, n.d.:**Online**),

“Objectivity is an unbiased mental attitude that allows internal auditors to perform engagements in such a manner that they believe in their work product and that no quality compromises are made.

Considering that an auditor's mental attitude is essential to the definition of objectivity, a methodology enhancing objectivity would probably have to consider elements of an auditor's mental attitude. As part of dissecting an auditor's mental attitude, the following areas will be reviewed:

- An auditor's mental attributes.
- An auditor's cognitive ability.
- Auditor bias and its related influence.
- Controlling bias and maintaining objectivity.

- **An auditor's mental attributes**

The International Organisation for Standardisation (2011:24) identified generic characteristics required of auditors which could be linked to an auditor's mental attitude. The list of attributes and personal behaviour included the following: ethical behaviour; open-mindedness; diplomacy; observant; perceptive; versatility; tenacity; decisiveness; self-reliant; acting with fortitude; open to improvement; culturally sensitive; collaborative.

➤ **An auditor’s cognitive ability**

Due to the definition for objectivity, an auditor’s cognitive ability, meaning the way an auditor thinks, has also been noted as a means to achieve a level of objectivity.

Caputo (2013:377:**Online**) citing Stanovic and West (2000) returned that cognitive functionality could broadly be divided into two systems, each with its associated attributes which have been tabulated in Table 3.3.

Table 3.3: Types of Cognitive functionality

(**Source:** Stanovic and West (2000) cited by Caputo, 2013:377:**Online**)

System 1	System 2
This type of thinking seems based more on emotions and less on rational thoughts.	This type of cognitive functionality is more logic and reasoning based.
Intuitive	Reflective
Automatic	Slower
Effortless	Conscious
Implicit	Determined
Emotional	Rational

Now in order to achieve auditor objectivity, it remains important for auditors to be aware of their own predominant thinking style. The main reason for identifying the predominant thinking style or pattern is to be aware of the pitfalls and bias related to the type of thinking and to guard against it, ultimately leading to a methodology which enhances objectivity.

➤ **Auditor bias and its related influence**

According to the Business Dictionary.com (n.d.:**Online**) objectivity can be defined as follows,

“(as far as possible or practicable) to reduce or eliminate biases, prejudices, or subjective evaluations by relying on verifiable data.”

So what is bias and how can it be managed? Caputo (2013:375-376:**Online**) provided the following insight. Bias is related to limited cognitive functionality and is evident by a lack of rational thought.

However, objectivity can be achieved when auditors endeavour to remain free from bias, by adopting steps and employing auditing methodologies that counter the influence of bias (Karapetrovic & Willborn, 2001:369:**Online**).

Realising the importance of controlling bias and maintaining objectivity, especially when making decisions and identifying risk, has led the researcher to evaluate the effects of bias in auditors. These topics are discussed next.

➤ **Influence of bias when making decisions:** Caputo (2013:374:**Online**), evaluated the influence that bias has on the quality of decisions made. The study highlighted that twenty-one types of biases generally could occur within the decision making process. However only a few have been noted for the purpose of the study, namely: Framing; Emotional bias; Overconfidence; Intergroup bias; Relationship bias.

These biases were noted to influence human behaviour, which in turn influenced the decisions made by individuals. The study also highlighted that even though all individuals are affected by bias, understanding the type of bias present and the reason for the specific biases may potentially assist in mitigating its effect.

➤ **Influence of bias in identifying risk:** A study performed by Leveson (n.d.:**Online**), which dealt with risk assessment in the area of aeronautics and astronautics was noted as being relevant to this topic. Leveson unpacked the topic of risk identification. The study identified specific influences on objectivity and specifically dissected the topic of bias and its effect on individuals. According to the study, heuristic biases assist individuals in making sense of a particular situation and is therefore able to influence the decision making process particularly in risk identification. A list of bias types have been discussed briefly in the following sections (Leveson, n.d.:7:**Online**):

➤ **Confirmation bias:** Occurrences of this type of bias are evident when individuals pay particular attention to information, situations,

conditions that will support an existing opinion, view or understanding of a particular individual or group.

➤ **Availability bias:** Instances of this type of bias are evident when individuals are more likely to raise concerns when previous data is readily available and are readily recalled by the individual.

➤ **Defensive bias:** As part of this type of bias, also called *defensive avoidance*, there is a tendency to deny or rationalise certain difficult topics as these instances may result in confrontation, possible conflict and possible stressful situations.

Once biases are identified, only then may mitigation actions be put in place to allow for control. It is this aspect that will be discussed next.

➤ **Controlling bias and maintaining objectivity**

Leveson (n.d.:**Online**) returned that biases are an unavoidable part of decisions making processes and in particular risk recognition, and stated that existing biases may potentially influence risk assessments if individuals are unaware of such biases. The author returned that if these biases are not managed (i.e. identified, understood and controlled), risk evaluations and decisions related to this process may yield faulty results, possibly having dire consequences. Leveson's study returned that by identifying and understanding biases, individuals are able to negate the effect of these psychological influences, in order to remain objective and to effectively identify significant risk. The study continued by promoting the use of a structured process approach to identify and assess risk and minimise the effect of bias on decision making activities.

This recommendation of using a structured process speaks directly to the definition noted for objectivity in the study by Karapetrovic and Willborn (2000:680:**Online**) as noted earlier in Section 3.5.3, where objectivity can be enhanced by employing some method of consistency.

In conclusion, heuristic biases cannot be completely removed but as mentioned before, awareness and identification of possible auditor biases and the implementation of a systematic approach will support auditor

objectivity needed in the process of effective risk recognition and improved decision making with minimal psychological influences.

Thus far, auditor independence and auditor objectivity has been reviewed as part of the auditor role. In the next section, additional information related to auditor competency will be reviewed.

3.5.5. Auditor competency

In order to elaborate on the concept of auditor competency, the concept of professional competency will first be dissected. The review included:

- Various definitions of professional competency.
- Various competency models.
- Specific nuclear auditor traits

3.5.5.1 Professional competency

Individuals with the right skills set and competencies have the ability to assist organisations to retain its market share and remain sustainable through effective performance. However, like with so many characteristics such as competency, an element of subjectivity is usually at play. Therefore what may be considered as “competent” in one organisation may be different to that in another organisation. This level of subjectivity related to competency and competence may challenge organisations to optimally improve the skills needed of its professionals within the organisation. In order to mitigate such levels of subjectivity, employing documented definitions and researched competency frameworks may assist organisations in determining the skills set and competencies needed by their professionals (Bergenhengouwen, 1996:29-30:**Online**; Lindsay and Stuart, 1997:327:**Online**; Cheetham and Chivers, 1998:**Online**). Therefore the definitions and models related to competency will be discussed next.

3.5.5.2 Competency definitions

The International organisation of standardisation (2005:18:**Online**) provided the following minimal definition for competency,

“Demonstrated personal attributes and demonstrated ability to apply knowledge and skills.”

Lindsay and Stuart (1997:327:**Online**) provided the following specific definition for competencies,

“What the organization values in the person arises out of the possession and deployment of complex sets of behaviours.”

Linked to definition is the concept of being deemed “competent”, which is defined by Boyatzis (1982) and cited by Lindsay and Stuart (1997:327:**Online**),

“A statement of the ascribed value that is placed on one’s contribution.”

Therefore the concept of competency may differ based on profession, industry and could even be linked to an organisation’s unique requirements such as its culture and values. As part of reviewing the definitions and elements comprising the concept of competency, a number of permutations were noted in literature. These have been discussed in the section that follows.

3.5.5.3 Competency models

Hassall, Dunlop and Lewis (1996:**Online**), dealing with professional competency, identified the following significant attributes of competency:

- Competency as related to a competent professional encompasses both knowledge and practical skills.
- Besides knowledge and practical skills, the ability to contextualize situations and apply required skills and knowledge depending on the situation, is deemed as an additional attribute, concluding that competence is a combination of both knowledge and cognitive abilities and processes.
- The merits of implementing the use of case studies as part of professional development, was noted, which supports the application of skills and knowledge in a “dynamic” environment.

A later study by Cheetham and Chivers (1998:267:**Online**) returned that competency could be divided into two main components, namely:

- **Personal competence:** Where this competence is reflective of emotional maturity and identifiable by: self-confidence; control of emotions and general interpersonal skills.
- **Functional competence:** Where this competence is related to the skills required for the specific job and usually include technical skills and the required qualifications.

In addition to these main elements, Cheetham and Chivers (1998:267:**Online**) also referred to:

- **Meta-competencies:** Related to attributes that enhance the overall learning and competency of an individual such as: problem-solving skills; creativity and communication skills, to name a few.
- **Ethical element:** Noted as a valuable input to competency.

According to the authors, different professions require all these elements in varying degrees. Cheetham and Chivers' perception of a competency framework has been depicted in Figure 3.4.

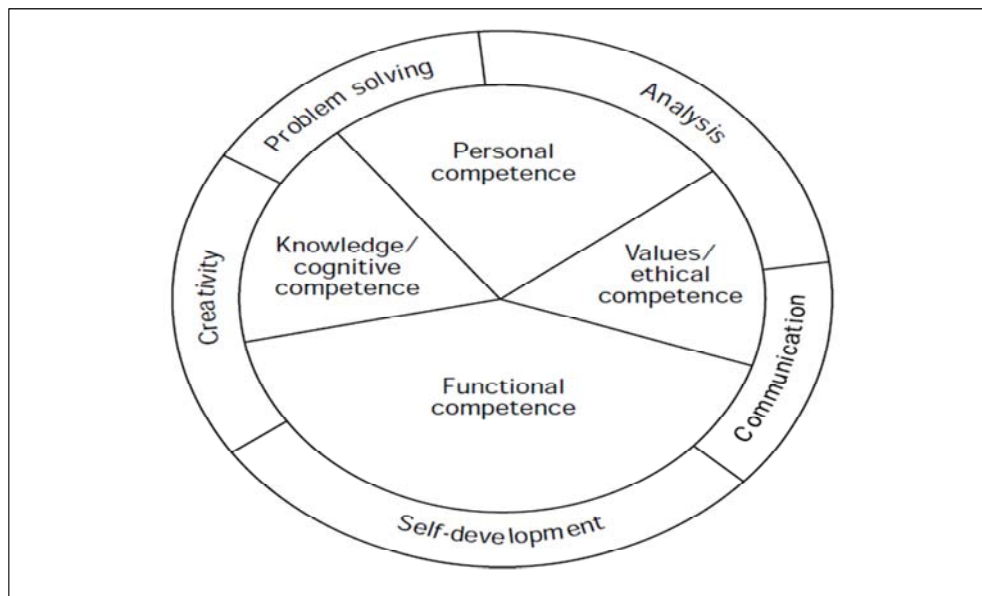


Figure 3.4: Contributors to effective performance
(**Source:** Cheetham and Chivers (1998:270:**Online**))

Besides the elements noted in Figure 3.4, Cheetham and Chivers (1998:**Online**) citing Schön (1983; 1987) also highlighted the value of

reflection (related to “knowing-in-action” and tacit knowledge). According to these authors reflection has the potential to initiate behavioural modification in professionals, which can ultimately lead to improved professional competence. Contrary, in a later study, Cheetham and Chivers (2000:382:**Online**) added that reflection seemed to influence the improvement of existing competence rather than assisting or aiding with the initial gain of professional competence (Figure 3.5).

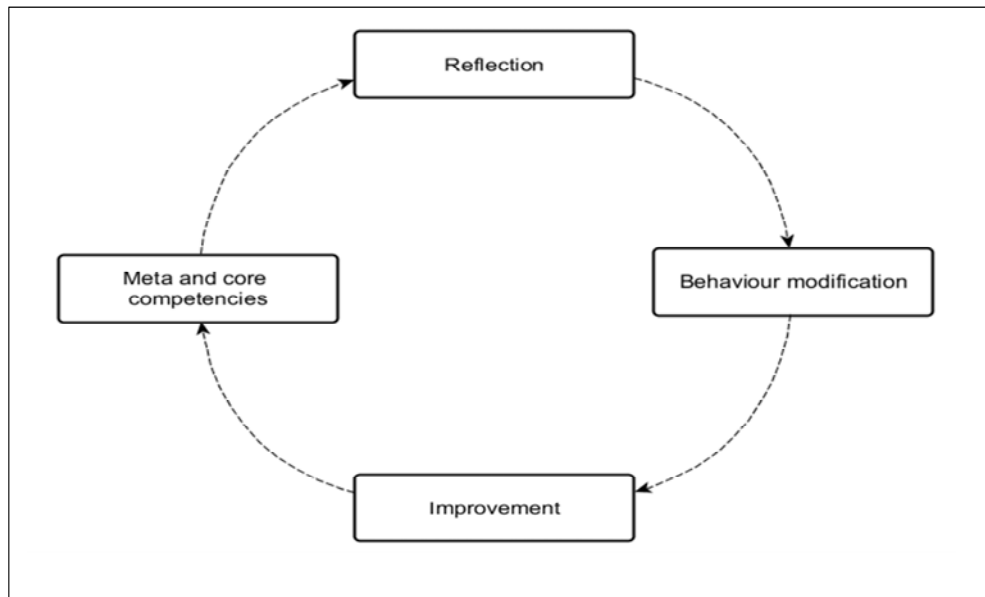


Figure 3.5: The effects of reflection on professional competence
(**Source:** Schön (1983; 1987) cited by Cheetham and Chivers,1998:**Online**)

Hassall, Dunlop and Lewis’ (1996:Online) supported Cheetham and Chivers’ opinion related to: the ability to contextualise situations; application of required skills and knowledge depending on the situation; and the use of experiences/learnings noted in case studies, as part of displaying a level of competency.

Similar views were noted by Becket and Murray (2000:127:**Online**) as part of their study which assessed the value of auditing in the process of knowledge development. In the study, the value of audit team discussions in relation to a wide range of topics which may include: business performance; and strategic challenges, was noted as opportunities for reflection and learning amongst auditors.

Besides the information noted above, Cheetham and Chivers (2000:382:**Online**) also provided additional information regarding the way professionals approached solving problems. According to the authors, in order for professionals to succeed in problem solving, the elements noted below are required in some form or fashion:

- Repertoire of solutions- memory related to previous solutions.
- Access to expert advice.
- Creativity.
- Lateral thinking.
- Common sense.
- Technical approach which includes: first principles and basic theory.

These views also resembled those expressed by Hassall, Dunlop and Lewis (1996:**Online**).

The specific traits required of a quality auditor in a nuclear environment will be reviewed in the section that follows.

3.5.5.4 Specific nuclear auditor competencies traits

To support the honing of skills and continuously improving the capabilities of the auditor in high risk organisations, such as in the nuclear industry, Beckmerhagen *et al.* (2004:15:**Online**) stated that audit activities should always be evolving in order to keep up with operational changes. Inferred by this evolving audit activity would be the evolving of the skills required of the quality auditor.

The Chartered Quality Institute (n.d.:**Online**) likewise supported the continuous development of quality professionals, which included quality auditors. Evident in the research performed in this area, resulted in the Body of quality knowledge (BOQK), a documented reference developed by the organisation. In addition, Jeary (2012:8:**Online**) citing the National Skills Academy identified the following generic skills areas for quality professionals:

- Technical.
- Business improvement.
- Compliance.

- Functional and behavioural.

In addition the same source citing a nuclear special interest group (2011) identified specific knowledge requirements for nuclear quality professionals. These included the following:

- Management systems.
- Hazards and safety.
- Organisational design.
- Records management.
- Knowledge management.
- Procurement.
- Configuration Management.
- Assessment of management system.

Besides noting the generic and specific skills areas, the Chartered Quality Institute (n.d.:**Online**) also developed a competency model (Figure 3.6). In this competency model the key elements noted are:

- The required leadership attributes.
- The required activities to be performed.
- Consideration of the organisation's environment or context.

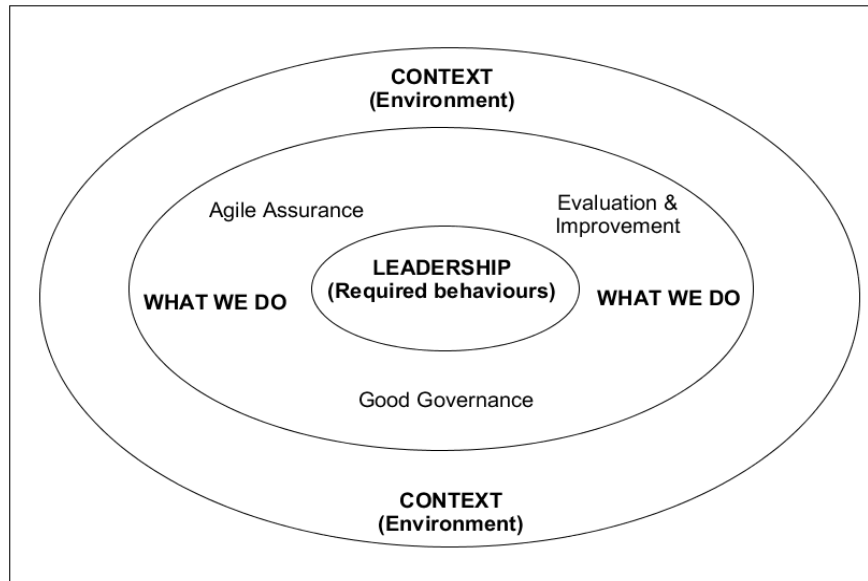


Figure 3.6: Competency framework
(Source: Chartered Quality Institute: **Online**)

In this framework, the focus seemed largely concentrated in the area of the required leadership traits of quality professionals in the nuclear environment. There are minor similarities to the views noted by Cheetham and Chivers'(1998:267:**Online**) regarding personal competence, however the Chartered Quality Institute framework far exceeds the detail noted for personal competence when compared to Cheetham and Chivers' model.

In order to appreciate the information captured in the seemingly basic model provided by the Chartered Quality Institute framework, the elements of the framework has been discussed to a greater extent in Table 3.4.

Table 3.4: Elements of the competency framework of the Chartered quality institute
(**Source:** Chartered Quality Institute:**Online**)

Element	Description
Leadership	<p>Attributes or leadership traits noted as critical in this area were noted as follows:</p> <p>Quality advocate: By promoting strategies to enhance the input of the particular quality function</p> <p>Stakeholder advocate: Promotes the interest of the organisation and any its stakeholders.</p> <p>Systems thinker: Promotes a systems approach to management of processes.</p> <p>Fact-based thinker: Advocates for a factual approach to decision making and performance measurement through objective indicators.</p> <p>Quality planner: Encourages quality planning in order to meet noted process objectives.</p> <p>Quality coach: Enhances the quality capabilities of the organisation through training and development.</p> <p>Quality motivator: Encourages individuals to take personal accountability for quality in their area of responsibility</p> <p>Quality collaborator: Team up and partner with all stakeholders to ensure quality outputs.</p>
Governance	A keen awareness of legislation and translating the necessary requirements into the organisation's management system. Operations. There is therefore an internal and external focus on governance.
Agile Assurance	This refers to using the most appropriate methods and tools as part of evaluating performance and identifying risk in the organisation as well as ensuring effective resolution of anomalies.
Evaluation and Improvement	This refers to using the most appropriate methods and tools as part of evaluating performance and identifying areas for improvement and change
Context	This element deals with identifying and understanding the needs and expectations of the various stakeholders. In addition, knowledge of assurance techniques and methods required for effective execution of tasks.

When reviewing the information provided by the Chartered Quality Institute in the competency model noted above, it can be appreciated that being a quality professional in the nuclear environment, including a quality auditor, requires a particular skills set, which may not be easily acquired. Further, working in an environment where errors can have catastrophic consequences, additional burden is placed on the performance by such professionals.

Relating all this to the role of the auditor, Robitaille (2014:58) advocated that auditors be mindful and responsive to the various types of risks in the areas they audit. By being mindful of the possible risks, auditors will be better equipped to identify, and so manage risk holistically in their organisations. In order to facilitate the identification and management of risk however requires auditors to develop familiarity with the various methods that are needed to manage overall risks within an organisation. It is this aspect that will be discussed in the next section.

3.6. RISK-BASED PROCESS MONITORING

Before any concept can be measured, understanding the purpose of a measurement, whether to: support decisions; reduce uncertainties; or reap certain benefits, needs to be understood. In addition, a clear definition of the concept being measured is required as well as identifying the specific indicators that will reflect the presence of that concept. Finally, only once all these elements are identified and understood, can the amount of energy and effort needed as part the measuring process be determined (Hubbard, 2010:21).

Alluding to the purpose of measuring the concept of risk, Tummala and Leung (1996:54:**Online**), returned that identifying risk and related uncertainties, as part of an audit process is predominantly for influencing decision-making processes. Decision-making processes which could influence the achievement of business goals, objectives and result in improved business performance. And therefore establishing methods needed as part of measuring risk is considered pertinent to the study.

In this section of the literature study, the topic of risk-based process monitoring will be evaluated. However before continuing in that direction, the concept of risk and risk management will briefly be discussed by answering the following questions:

- What is risk?
- Why should risk be managed?
- How can risk be managed?

3.6.1. Defining risk

In answering the question, “*What is risk?*” a number of definitions were obtained from multiple sources. For ease of reference, these definitions have been captured verbatim in Table 3.5.

Table 3.5: Definitions of risk

(**Source:** Frosdick (1997:165:**Online**) citing the Royal Society Study Group (1992:2); International Organisation for Standardisation (2002:73: **Online**) and Gehman, Lefsrud & Lounsbury (2014:2:**Online**))

Source	Definition
Frosdick (1997:165: Online) citing the Royal Society Study Group (1992:2),	The probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge.
International Organisation for Standardisation (2002:73)	Risk is the combination of the probability of an event and its consequences.
Gehman, Lefsrud and Lounsbury (2014:2: Online)	Risk is commonly understood as the likelihood of an adverse event, together with its consequences.

The key concepts identified in each of the three definitions provided were listed below. In addition, Lévêque (2013:2:**Online**) clarified these terms with the following explanations:

- **Probability of failure (PoF):** This term refers to the chance of an event occurring and is related to the likelihood of failure.
- **Consequence of failure (CoF):** This refers to the damage caused by an event. In other words, the impact of an event on an area of importance, such as: safety, health, environment business, plant or production.

3.6.2. Why manage risk?

Kendrick (2004:70:**Online**), provided the following response. According to Kendrick, risk management is generally well established in all organisations who strive for excellence in business performance and business sustainability.

Comparably, Sarens and De Beelde (2006:64&66:**Online**) returned that risk management can be considered a business strategy which enables any organisation to have a competitive advantage over its competitors.

3.6.3. How to manage risk?

The International Organisation for Standardisation (2002:73:**Online**) offered the following definition for risk management,

“The systematic application of management policies, procedures, and practices to the tasks of analyzing, evaluating and controlling risk”.

Supporting the definition for risk management, Kendrick (2004: 70:**Online**) offered the fundamental and well-established stages to a risk management process. Supporting Kendrick; Wisniewski and Porter (n.d.:**Online**), provided a simple dissection of the topic by identifying pertinent questions which may be used to understand and achieve risk management outcomes. These questions along with the associated outputs have been tabulated in Table 3.6.

Table 3.6: Dissection of the aspect of risk assessment

(**Source:** Wisniewski & Porter, n.d.:**Online**)

Question	Related output
What can go wrong?	This related to identifying the risk.
How bad are the consequences?	This relates to the consequence of the failure and is related to severity (CoF).
How often does/will it happen?	This refers to probability of occurrence (PoF).
If it happened, how would we know?	This relates to the likelihood of detection.
Is the risk acceptable?	This refers to performing a risk evaluation and determining remediation.

Furthermore, Wisniewski & Porter (n.d.:**Online**) citing the US department of health also clarified the topic of risk assessment in Figure 3.7.

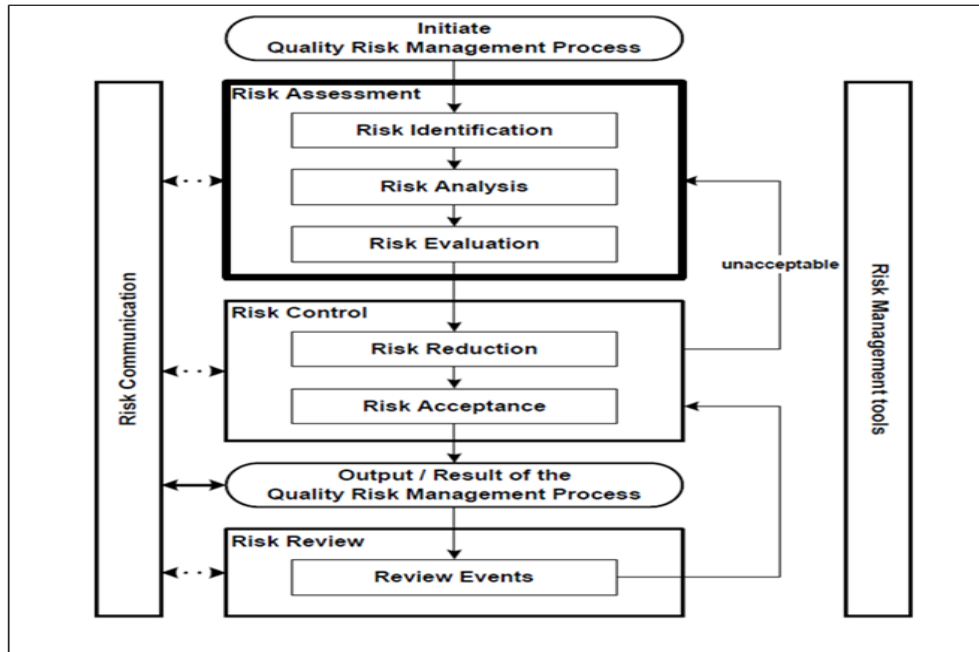


Figure 3.7: Overview of a typical quality risk management process
 (Source: US Department of Health cited by Wisniewski & Porter, n.d.:**Online**)

Supporting the risk management process represented in Figure 3.7, Frosdick (1997:167:**Online**) provided the following definition of risk management,

“...refers to planning, monitoring and controlling activities which are based on information produced by risk analysis activity”.

Further interrogation of the study by Frosdick (1997:167:**Online**) revealed that the concept of risk analysis was perceived as a collective of a number of activities (Strutt (1993) cited by Frosdick, 1997:167:**Online**) depicted in Figure 3.8.

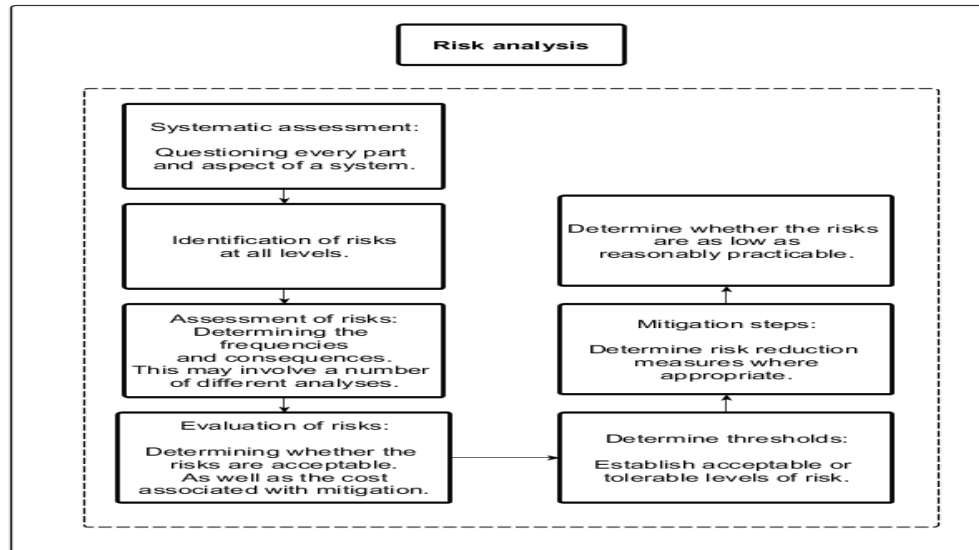


Figure 3.8: Components of risk analysis
(**Source:** Strutt (1993) cited by Frosdick, 1997:167:**Online**)

According to Frosdick (1997:167:**Online**) citing Strutt (1993), the term risk analysis is an all-encompassing term for activities such as:

- Risk identification.
- Risk assessment.
- Risk evaluation.

Comparing Figure 3.7, Figure 3.8 and the associated definition provided by Frosdick (1997:167:**Online**), similarities were noted between Frosdick's(1997:167:**Online**) definition of risk analysis and Wisniewski & Porter's (n.d.:**Online**) definition of risk assessment. These two sources seem to use the term risk assessment and risk analysis inter-changeably. Since these concepts seem pertinent in risk management, it was deemed prudent to further evaluate these concepts according to the sections noted in the risk management process flow:

- Risk identification.
- Risk assessment/ risk analysis.
- Risk evaluation.

3.6.4. Process of identifying risk

A number of methodologies may be adopted in identifying risk, depending on the specific environment and specific process being evaluated. The outcomes of two studies which were reviewed on the topic of risk identification have been discussed in the subsequent sections:

- Turner's organic versus mechanistic risk identification.
- Frosdick's intuitive, inductive and deductive risk identification.

3.6.4.1 Turner's organic versus mechanistic risk identification

Turner (2014:**Online**) discussed two main approaches employed when identifying risk within a project management environment. Each process adopts a particular mind-set while identifying risks and each approach deals with the identified risk in a specific way. These approaches were noted as follows:

- **The organic, creative approach:** This approach encourages creative, free-flowing thinking by identifying potential risks using brainstorming methods. The organic, creative approach identifies risks that may be considered as unique and unanticipated therefore allowing for: the generation of many ideas; and possible identification of a significant, yet obscured risk.
- **The mechanistic process:** This approach adopts a more structured approach, whereby process outputs are identified and specific risks to each output is identified. The mechanistic approach systematically fragments the particular system in order to evaluate risk at specific outputs or milestones.

3.6.4.2 Frosdick's intuitive, inductive, deductive risk identification

According to Frosdick (1997:167:**Online**), the following general categories of risk identification techniques exist:

- **Intuitive methodology:** This category is identifiable by simple and rapid outcomes. The most well-known technique within this category is the brainstorming exercise performed by a group.

- **Inductive methodology:** Techniques associated with this category include the hazard and operability studies, better known as HAZOP. As the title of this category indicates inductive thinking is required and risks are identified by asking the question “what if?”
- **Deductive methodology:** Deductive thinking is the basis of this risk identification category. Risks are identified by asking the question “so how?”. This methodology therefore requires retrospection and reflection of existing or past events. Techniques included in this category include: event and fault tree analysis.

In the subsequent sections a review of methods used to assess and evaluate risk will be discussed.

3.6.5. Process of assessing and evaluating risk

Calado, Silva, Oliveira, Spagnol, Sarantopoulos and Li (2014:23:**Online**) citing Johnson *et al.* 2007 returned,

“If we cannot measure, we cannot improve”

Besides identifying risk, the importance of constantly measuring indicators of risk cannot be ignored. In addition, the value of monitoring specific indicators in order to assess the condition of processes has also been well documented in literature, revealing that monitoring specific indicators can assist in addressing defects and subsequently effect changes in processes and business performance (Smith, Bester & Moll, 2014:76).

Referring back to Figure 3.8, the concepts of assessment and evaluation of risk are differentiated as follows (Strutt (1993) cited by Frosdick, 1997:167:**Online**):

- **Assessment:** These activities generally are related to determining the frequencies and consequences of identified risk.
- **Evaluation:** This is the process of determining the acceptable levels of risks and is specifically related to defining tolerance levels.

In the next sections, risk assessment and risk evaluation will be discussed in greater detail.

3.6.5.1 Assessment of Risk

As previously mentioned, the assessment of risk includes steps to determine the frequencies and consequences of identified incidents (Strutt (1993) cited by Frosdick, 1997:167:**Online**). In general these two terms: Probability of failure (PoF); and Consequence of failure (CoF), is used to asses risk and quantify risk analysis to some extent.

According to the European committee for standardization (2008:43-44), determining the probability of failure as well as the consequence of failure can be determined through a number of methods. A few of these methods have been tabulated below.

Table 3.7: Methods employed in determining the key concepts related to risk

(Source: European committee for standardisation, 2008:43-44)

Determining PoF	Determining CoF
Evaluating historical data	Evaluating data
Methods of forecasting or modelling	Forecasting of future behaviour
Using expert judgement	Using expert judgement

By determining the Probability of failure and Consequence of failure for a particular event or incident, the information necessary to quantify risk is accessible and allows for the risk to be further evaluated. Additional detail regarding risk evaluation will be discussed in the next section.

3.6.5.2 Evaluation of risk

In an attempt to quantify and evaluate risk, as previously mentioned, requires continual consideration of the following key elements: Probability of failure; and Consequence of failure (Turner, 2014:**Online**). Once determined, risk can be quantified. As part of quantifying risk though, it is required that risk be placed into categories. Specifically Turner (2014:**Online**) advises that risk be evaluated in order to determine whether risks are: significant; trivial; acceptable; or not acceptable. However in order to determine whether identified risk are either significant or trivial requires a measure against certain tolerance levels. And therefore tolerance levels need to be determined.

Once tolerance levels are determined, which are normally specific to an organisation's risk tolerance or appetite, further evaluation of the risk can take place. In summary the evaluation approach using a model proposed by Turner (2014:**Online**) is as follows: An organisation should specifically define: risk tolerance levels; the various risk categories; and the specific criteria used to determine the various categories for both the likelihood and consequence related to an event. The model as depicted in Figure 3.9 can then be customised. Once the model is customised, risk can be evaluated using the criteria set up by the individual organisation.

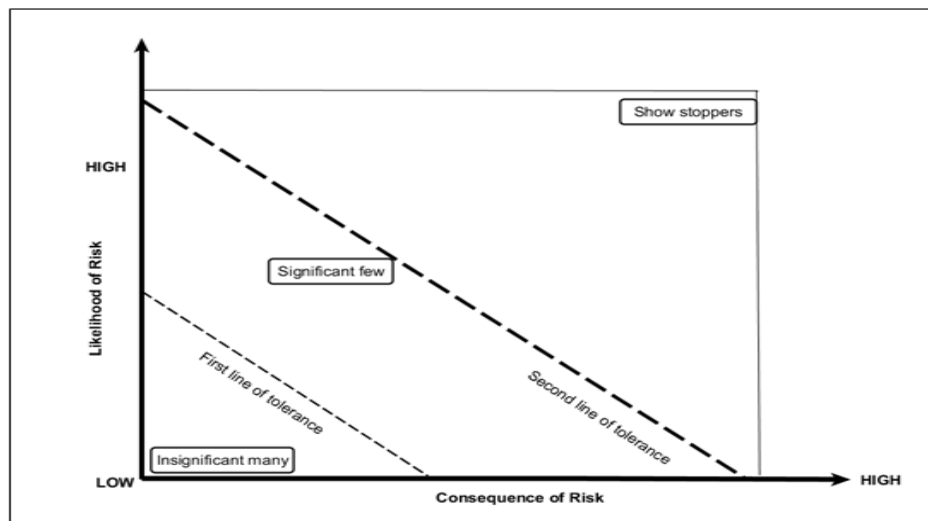


Figure 3.9: Likelihood vs Consequence plot

(Source: Turner, 2014:**Online**)

In addition, Turner (2014:**Online**) recommended the model be used to prioritise the identified risk, providing the following guidance on evaluating risk in a project setting as follows:

- Risks located above the first tolerance line are deemed to be significant and where a response to the risk is deemed necessary.
- Risks located above the second tolerance line are deemed to be critical, and if left unattended in a project environment would result in the execution of the project being reconsidered.
- In addition, Turner (2014:**Online**) citing The Project Management Institute (2013) suggested that organisations implement at least four categories in evaluating risk, instead of the usual three categories of low, medium and high.

In support of Turner (2014:**Online**), Frosdick (1997:171-174:**Online**), also returned that once risk has been identified, the following items require defining to enable risk evaluation:

- Risk tolerance levels.
- The various risk categories.
- Specific criteria to be used to determine the various categories for both the likelihood and consequence.

Tolerance levels can be determined by a number of means which will be discussed in the following section.

3.6.5.3 Determining tolerance levels

A few examples of tactics used in determining tolerance levels have been tabulated below (Frosdick, 1997:172:**Online**):

Table 3.8: Strategies used in determining tolerance levels

(Source: Frosdick, 1997:172:**Online**)

Type of risk evaluation technique	Specific technique
Specific engineering risk evaluation	Risk criticality matrices. The As Low As Reasonably Practicable (ALARP) principle.
Specific economic risk evaluation	Market mechanism. Cost effectiveness and cost benefit analysis.

From the literature reviewed it is apparent that a number of approaches exist which can be adopted in determining tolerance levels. And therefore it is not surprising that inconsistencies in risk evaluation may occur. This links to Turner’s (2014:**Online**) warning that the evaluation of risk can potentially be riddled with irrational thought which could lead to resources and time being ineffectively allocated to resolve trivial and insignificant risks.

Gehman, Lefsrud and Lounsbury (2014:**Online**) highlighted the necessity of considering certain psychological biases when employing risk evaluation techniques. These sentiments were also expressed by Caputo (2013:**Online**) and was noted in previous sections of this study.

In the next section the challenges related to risk evaluation and particularly risk tolerance levels will be discussed.

3.6.5.4 Challenges in risk evaluation

Based on the diverse methods used to determine tolerance levels and variation in an organisation’s risk appetite, it remains important to be aware of variations that may occur when evaluating risk. Part of this variation may be linked to the cognitive aspect of risk evaluation previously mentioned. Frosdick (1997:173:Online) citing Fischhoff and Slovic (1983) referred to a number of cognitive theories related to risk evaluation which have been summarised in Table 3.9.

Table 3.9: Types of cognitive theories related to risk evaluation

(Source: Fischhoff and Slovic (1983) cited by Frosdick (1997:173:Online)

Theory	Key aspects
Risk/risk comparison	This technique compared the probabilities of various risks occurring.
Risk homeostasis theory	This technique compared risk on the basis of the potential gains.
Tolerability of societal risk	This theory relays that a society is more likely to tolerate certain risks compared to others.
The psychometric approach	This cognitive theory conveyed that the ordinary man is not concerned about the probability of failure but is more concerned about the consequence of a failure.

Gehman, Lefsrud and Lounsbury (2014:2:Online), while evaluating risk in the environment and energy industry, identified two high level approaches that could be adopted. The two approaches are the *Techno-economic* approach and *Socio-cultural* approach. Each approach encompasses aspects through which risk can be understood and evaluated. These approaches have been noted as follows:

- **The Techno-economic approach:** This approach encompasses both technical and financial considerations when evaluating risk.
- **The Socio-cultural approach:** In this category both perceptual and cultural considerations are included as part of the risk evaluation process.

Gehman, Lefsrud and Lounsbury (2014:**Online**) highlighted that risk is a complex concept and in order to evaluate risk holistically, an appreciation and possibly the adoption of the four mind-sets noted above would be required. However each mind-set has its own associated advantages and disadvantages and has the ability to affect and influence the evaluation outcome uniquely. When comparing the cognitive categories noted by Gehman, Lefsrud and Lounsbury (2014:2:**Online**) to those noted by Frosdick (1997:**Online**), similarities were noted.

In summary, risk evaluation is concerned with various aspects of quantifying risk. But what happens when quantifying risk poses a challenge? This topic will be discussed in the next section.

3.6.6. QMS audit role in risk management

Sarens and De Beelde (2006:66:**Online**) highlighted that an internal audit is one tactic that can be used to achieve the competitive edge over one's competitors. Similarly, Robitaille (2014) supported this opinion but highlighted that besides reaping the benefits of process and business improvements, one of the key functions of the QMS audit was to pre-emptively identify risks inherent to business processes.

3.6.6.1 Risk identification as part of the audit process

Kendrick (2004:70:**Online**) similarly discussed the role of audits in risk identification, by noting the various types of quality audits (product audits; process audits; systems audits). Each audit has a specific scope and objective, with a specific focus for risk identification. In addition, Kendrick (2004:70:**Online**) averred that quality audits, by the mere nature of the monitoring process, would detect risks, forming a crucial step in an organisation's risk recognition approach. The following risk areas would naturally be evaluated as part of an auditing activity:

- Risk to the business environment.
- Risk to production and financial profit.
- Risk to meeting operational outputs.
- Risk to reputation and credibility.

- Risk of non-compliance to various regulations, legislations and corporate governance.

Audits are also able to identify risk through the process of evaluating and analysing previously documented information. In particular, discussions of past and recent accidents, incidents, defects and procedural shortcomings amongst auditors, may also provide the necessary insight to identifying and evaluating risk (Beckmerhagen *et al.*,2004:18:**Online**).

3.6.6.2 Risk analysis as part of the audit process

Specifically related to the auditing process and risk analysis/evaluation, Robitaille (2014) returned the following. Irrespective of the methodology employed in identifying the risks, merely identifying nonconformities as part of the audit process by the auditor may not be enough to convince management of: the risk inherent to certain processes; or the required decisions and actions needed to resolve anomalies.

Kendrick (2004:74:**Online**) returned that besides identifying and understanding risk within an organisation, although important steps in the overall process, more significant is the manner in which various role players, particularly management, respond to the identified risk. Merely identifying risk is therefore not sufficient; and further evaluations by the auditor will be required in order to influence decisions and actions. Generally these evaluations are completed by the auditor who provides a judgement/opinion related to the perception of risk as identified during the audit activity, which could potentially influence management decisions and actions and can therefore steer businesses in a particular direction.

In support of Kendrick (2004:**Online**), Robitaille (2014:43&49) recommended that auditors elicit the assistance from auditing colleagues when analysing nonconformities in order to better understand the effect, significance as well as risk profiling of the nonconformity within the QMS audit environment, and at the same time possibly mitigate auditor bias.

Reinforcing the importance of risk analysis in the context of QMS audits, Gehman, Lefsrud and Lounsbury (2014:**Online**), averred that the concept

of risk has become of paramount interest to an organisation's stakeholders, which may include: management, regulators and the wider community. Therefore acknowledging the relevance of audit findings in the management of risk and business performance by these stakeholders can assist organisations on various levels.

In the next section, the approach auditors could possibly adopt when relating audit judgements and opinions and which could enhance stakeholder endorsement of the audit findings and the overall audit process, will be discussed.

3.6.6.3 Risk evaluation as part of the audit process

“Auditors should have a means of measuring or judging the results and impact of matters identified on an audit”

This is the opinion of the Institute of Internal Auditors (2009:6:**Online**), which calls for quantifying the findings noted during audit activities.

Similarly Robitaille (2014:76) shared the importance of reporting effectively on the audit outcome and also highlighted the challenges auditors may experience as part of reporting the audit result, especially when specific risks are not readily quantified or suitably qualified. These challenges were alluded to earlier in this study (Robitaille, 2014:7&53).

When such challenging instances arise, it may be wise to develop a rating or grading system in conjunction with a formal criteria framework and associated methodology in which to evaluate these risks (Institute of Internal Auditors, 2009:6:**Online**). As part of developing and implementing the aforementioned grading system, criteria framework and methodology, a number of aspects require consideration.

These aspects include (Institute of Internal Auditors, 2009:4:**Online**):

- Determining the purpose of the assurance provided, which could include: whether to provide a statement of adequacy of internal process controls; a statement regarding process risk management; or a statement of compliance to organisational governance.
- Identifying the level at which assurance is provided to an organisation, whether at an organisational (macro) level or at a departmental (micro) level.
- Obtaining stakeholder concurrence on criteria to be adopted to ensure stakeholder endorsement once audit findings are evaluated and reported.
- Determining whether the proposed rating criteria will satisfy the unique business requirements.

Related specifically to the proposed criteria, it is recognised that the formulation of the criteria should consider current and future business needs. If determined to satisfy these measures, it can be concluded with a level of certainty that the criteria will be sustainable for an extended period of time.

By ensuring sustainability of the criteria and associated methodology, consistency is almost ensured, thereby assuring the credibility of the auditing organisation. Attributes of an adopted criteria should include (Institute of Internal Auditors, 2009:6&10:**Online**):

- Relevance to the organisation.
- Reliable, being able to provide accurate data.
- Neutral, therefore able to eliminate bias and subjectivity.
- Understood by all parties/stakeholders and considered as value-adding by all.
- Complete, considering all viewpoints to provide a holistic evaluation of the audit findings.

As part of formulating the framework for evaluating audit findings, the Institute of Internal Auditors (2009:10:**Online**) however advises against the use of certain terminology. Using terms such as “satisfactory”, “effective”, etc. without providing a meaning that is understood and agreed upon in

the organisation could result in both disputes amongst stakeholders but can also result in variability amongst auditors. Therefore the following elements are required when formulating a framework for evaluating audit findings:

- A clear and appropriately defined glossary.
- A frame of reference such as regulatory commitments, for which the auditors provide assurance.
- Clear guidelines that are applied consistently.
- A well-defined evaluation methodology to which auditors comply.

All these aspects noted by the Institute of Internal Auditors (2009:**Online**) were also iterated by the International Atomic Energy Agency (2014:4:**Online**). From developing and implementing a grading system with a criteria framework that speaks to organisational objectives right to implementing a systematic methodology which will provide consistency and remove bias during the process of evaluation.

When it comes to the actual formulation and evaluation of the audit findings, the Institute of Internal Auditors (2009:8:**Online**) recommended bearing the following in mind:

- **The materiality of a finding:** this translates into the effect of the finding and can be an indication of residual risk to business processes if the anomaly remains unresolved.
- **The impact of the finding:** this signifies the consequence or the implication of the anomaly if unresolved.

In summarising the literature reviewed by the Institute of Internal Auditors (2009:**Online**) and the International Atomic Energy Agency (2014:**Online**) the importance of managing risk as part of the auditing process in order to reduce uncertainties and allow organisations to reap certain benefits based on improved process control and ultimately achieve business objectives, were noted. These are views which were supported by Robitaille (201:26&59). The literature also clarified aspects of developing a measurement framework in which to evaluate audit findings and provide stakeholders with objective and significant audit opinions.

3.7. CONCLUSION

The objective of the literature study was to gain important contextual information necessary to address the stated research problem and provided adequate insight to achieve the associated research objectives.

The theories and concepts evaluated as part of this chapter included:

- **The purpose of QMS audits:** This area dealt with the evolution of the QMS audit and the changing role of QMS audits.
- **Audit process performance:** The elements affecting audit effectiveness was evaluated in this section. The elements that impact audit quality were also studied.
- **Audit findings:** Factors that influence the formulation of significant, reliable and value-adding audit findings were dissected to achieve clarity.
- **Auditor role and performance:** Aspects that affect an auditor's objectivity, independence, competency and knowledge base were considered.
- **Risk-based process monitoring:** Elements and methods used to holistically identify and evaluate risks within processes were examined.

Holistically, all the information gathered as part of the literature review provided a valuable foundation from which to continue the research study.

In the following chapter, seminal literature sources will be reviewed in order to select the most appropriate research methodology for this research study. Once chosen, the detailed methodology adopted will be discussed. Elements examined included: the instruments employed; the measurements and key variables to be used for the study; as well as the details of the methods used in collecting and analysing data.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1. INTRODUCTION

“To acquire knowledge, one must study; but to acquire wisdom, one must observe”

Marilyn vos Savant

In this chapter the collective approach used during the design phase of the research; the final research methodology adopted; as well as the empirical actions needed during the research study, will be discussed. However, before the most appropriate methodology could be chosen; literature was examined and the spectrum of methods available was reviewed. The following areas were examined as part of the literature study:

- An overview of research.
- An evaluation of various research methods.

4.2. AN OVERVIEW OF RESEARCH

According to Babbie (2010:92), the purpose of research study, also known as scientific enquiry, may be to either: explore, describe or explain phenomena, through observations and interpretations of observations. In order to better understand the purpose and reason for research design however, a discussion of the following elements would be required:

- Purpose of research.
- Research design methodology.
- Traditional research framework.

4.2.1. Purpose of research

A brief description of each research type and associated purpose has been provided below for clarification (Babbie, 2010:92):

- **Exploration studies:** The exploration study is geared mainly to satisfy curiosity. In such instances the researcher wishes to become au fait with the particular subject and find estimated answers.

- **Description studies:** The description study does not only focus on satisfying curiosity but elaborates in order for the researcher to answer specific questions such as *what, where, when and how*. In answering these questions, the researcher becomes more knowledgeable and is able to make deductions about the specific area.
- **Explanatory studies also called causal research:** The explanatory study is geared at determining the reasons for specific phenomena rather than just depicting what was observed as in the case of description studies. The fundamental question in this type of research comes down to *why* phenomena occurred.

Similar views related to the purpose of research study were also expressed by other authors such as: Jackson (2011:16); Zikmund (2003:54-56); and Welman and Kruger (2001:18).

4.2.2. Research design methodology

In order to choose a research methodology, researchers are required to firstly identify and understand elements such as: central purpose and objective of the intended research study. Once understood, the possible research approach and associated methods could be considered; and the most suitable research methodology can be chosen (Blaxter, Hughes & Tight, 2006:80).

Zikmund (2003:74) provided a practical approach to Blaxter, Hughes and Tight's (2006:80) recommendation, and proposed certain high level questions noted in Figure 4.1 be considered by all researchers.

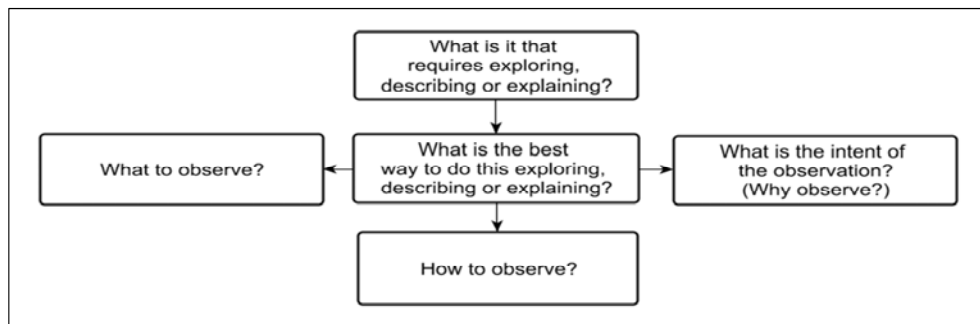


Figure 4.1: Practical steps for identifying a research methodology

(Source: Zikmund, 2003:74)

Answering the questions noted in Figure 4.1, provides clarity about the purpose and objective of the intended research study; and aids the researcher in identifying the required variables and measurements needed for the study. Once this understanding is accomplished, only then should the most appropriate research methodology be selected from the vast array of recognised approaches available to the research fraternity.

4.2.3. Traditional research framework

Babbie (2010:114) offered a generic framework that provides the proverbial roadmap for research study. The highlighted sections of the framework in Figure 4.2 have been deemed as important elements and have been elaborated on in the subsequent sections of this chapter:

- Evaluating various research methods.
- Selecting an appropriate research methodology.
- Instruments employed: Observation techniques.
- Sampling and selection.
- Data type, measurements and variables.
- Operationalisation.

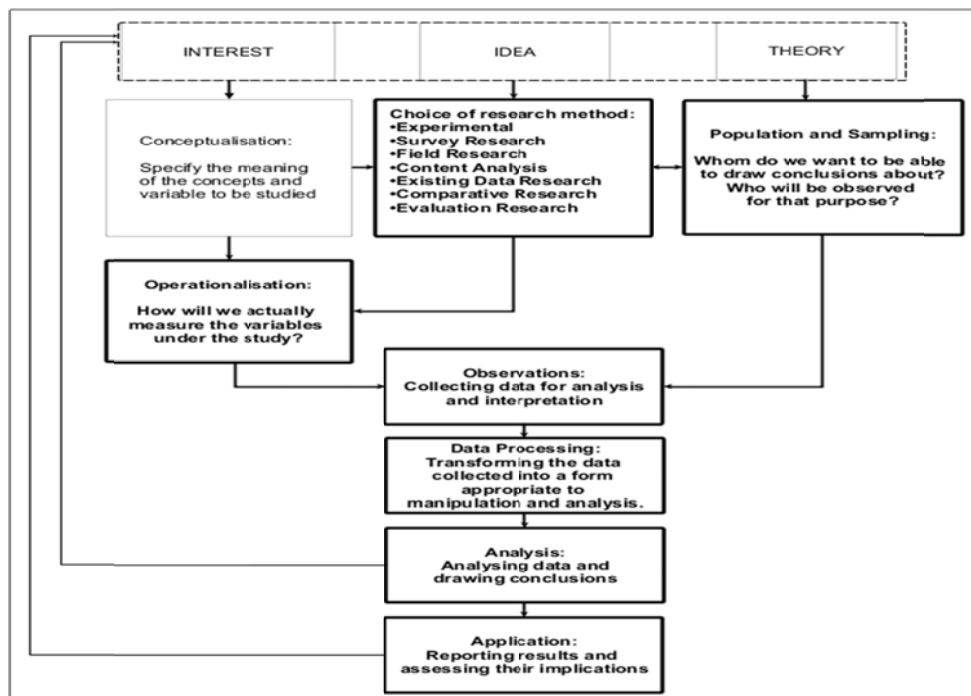


Figure 4.2: Traditional research framework

(Source: Babbie, 2010:114)

4.3. EVALUATING VARIOUS RESEARCH METHODS

Blaxter, Hughes and Tight (2006:62) returned that research is a systematic process that investigates resolutions and remedies to a problem. In order to unpack the block noted “*Choice of research method*” noted in Figure 4.2, it was required to review research typology.

Research types can be divided into the following categories: qualitative and quantitative. A simplistic distinction between the two paradigms is provided as follows (Punch (2005) cited by Blaxter, Hughes & Tight, 2006:64),

“Quantitative research is empirical research where the data are in the form of numbers. Qualitative research is empirical research where the data are not in the form of numbers.”

Further evaluation revealed that more significant differences existed. A sample of such differences was noted verbatim in Table 4.1.

Table 4.1: Key differences between qualitative and quantitative research
(Source: Oakley (1999:156) cited by Blaxter, Hughes & Tight, 2006:65)

Qualitative	Quantitative
Concerned with understanding behaviour	Seeks the facts/ causes of social phenomena
Researcher is close to the data and has an insider perspective	Researcher is removed from the data and has an outsider perspective
Assumes a dynamic reality	Assumes a stable reality

As previously noted by Blaxter, Hughes and Tight (2006:80), the choice of research approach should be guided by the required variables and measurements, once these are identified. These sentiments are shared by Mouton (2001:145), who returned that the most appropriate research methodology can only be selected from the vast array of recognised approaches available to the research fraternity once the data sources and the specific measurable/s are determined.

Available research methodologies were evaluated according to: research purpose/objective; sources of data; as well as the type of data (quantitative vs qualitative). For practical purposes however only selected

empirical methodologies were reviewed and discussed. The selection of methodologies included:

- Secondary data analysis (SDA).
- Content analysis.
- Case study.
- Experimental research (evaluation).
- Quasi-experimental research (evaluation).
- Evaluation research: Implementation (process) evaluation.
- Participatory action research (qualitative).
- Mixed method research.
- Survey Research.

4.3.1. Secondary data analysis (SDA)

Babbie (2010:288) returned that the essence of this study involved the analysis of pre-existing data for descriptive or explanatory purposes. The data may vary, but has been found to be predominantly of a quantitative nature. A strength related to this type of study is the need for limited resources (including both finances and time) as no active sampling is required. A noted limitation of this approach includes no active control over data collection techniques. Standard statistical analysis is associated with this type of study. The description of this type of research is similar to that shared by Mouton (2001:164).

4.3.2. Content analysis

According to Zikmund (2003:248) the aim of this study type is the analysis of content of pre-existing documents for descriptive or exploratory purposes. The data may consist of text, diagrams, or other measurables, but is slanted towards quantitative data. A strength related to this type of study is the reduced error due to researcher observer interaction. A noted limitation of this approach however includes the level of data authenticity. Descriptive statistical analysis is associated with this type of study. Once again Mouton (2001:165) shared a similar opinion of this research type.

Swetnam (2004:39) speaks of Historical research which resembles content analysis but warns that this research is also riddled by the same pitfalls as other research methods and therefore requires the same amount of attention and due diligence as any other type of study.

4.3.3. Case studies

Welman and Kruger (2001:21 & 83-184) noted that case studies are generally of a descriptive and possibly exploratory nature which allows for a thorough investigation of multiple subjects. Generally qualitative data is collected and analysed through analytical induction. The associated strengths of this type of study include the generation of comprehensive awareness by the researcher. The approach is however riddled with time consuming data collection and analysis activities. In addition it was highlighted that this approach was not suitable for evaluating the implementation of solutions.

Mouton (2001:149); Blaxter, Hughes and Tight (2006:71); Babbie (2010:309) and Leedy and Omrod (2005:135) all supported the opinion provided by Welman and Kruger (2001).

4.3.4. Evaluation research: Experimental; Quasi-experimental and Implementation (process) evaluation

Mouton (2001:158-160) returned that the evaluation research type is primarily considered as descriptive and explanatory in nature. The approach generally includes experimental and quasi-experimental outcome studies and is synonymous with an applied approach, which aims to find a solution for a workplace problem. The data is usually gleaned from all types of sources. The analyses adopted in this type of research include structured analyses such as ANOVA and regression analysis. This study type is identifiable by accurate assessment of causal outcomes but is riddled by potential errors such as sampling and measurement errors.

Welman and Kruger (2001:69&79) offered a similar estimation for both the experimental research and the quasi-experimental approach. While

Babbie (2007:371) provided comparable insights related to the quasi-experimental research method as noted by Mouton (2001).

Collectively, Blaxter, Hughes and Tight (2006:74); Babbie (2010:233& 370) as well as Swetnam (2004:36) all provided similar perceptions and supported the view noted by Mouton (2001).

4.3.5. Participatory research/ Action Research (PAR)

Babbie (2010:313) explained that Participatory research/ Action Research (PAR) is considered a descriptive and explanatory type of research that involves subject involvement. PAR is synonymous with an applied research approach and is identifiable by a strong participant researcher partnership which utilises data from a wide range of sources. The analyses adopted in this type of research include methods related predominantly to qualitative data analysis (QDA) and is also identifiable by high levels of inference due to the high construct validity which relates to the method of obtaining information through subject participation. An associated shortcoming is the lack of being able to generalise both the findings and explanations noted in this type of study.

Welman and Kruger (2001:21); Mouton (2001:150) and well as Jackson (2011:105) supported the view by Babbie (2010), that PAR is ideal for improvement initiatives, through education and development.

4.3.6. Mixed method research

Bulsara (n.d.:**Online**) citing Tashakkori & Teddlie (2003) referred to mixed method research as,

“... a third methodological movement in the social and behavioural sciences”.

Bulsara (n.d.:**Online**) also provided the purpose for this type of research approach as follows,

“The purpose of this form of research is that both qualitative and quantitative research, in combination, provide a better understanding of a research problem or issue than either research approach alone.”

According to Blaxter, Hughes and Tight (2006:84), researchers may at times decide to employ more than one method. In such instances, this approach is commonly known as a mixed method methodology.

Similarly, Creswell (2009:203-204) also proposed the use of a mixed method approach in order to enhance understanding and potential insight through both quantitative and qualitative approaches. The degree of combining the qualitative and quantitative methodologies could vary and would depend on a number of factors such as: the purpose of the research study; research constraints; the researcher's focus and perception; as well as the focus of the research questions. A number of mixed method strategies exist. A sample of these of strategies noted by Creswell (2009:211-216) will be discussed in the following sections:

- Sequential explanatory strategy
- Sequential exploratory strategy
- Sequential transformative strategy
- Concurrent triangulation strategy
- Concurrent embedded strategy
- Concurrent transformative strategy

Each strategy will be illustrated in the subsequent sections using figures along with a brief summary relaying the key elements of each strategy.

4.3.6.1 Sequential explanatory strategy

This strategy, which is used to dissect and explain concepts, collects both quantitative and qualitative data which is analysed one after the other. This strategy has been shown to be useful when unanticipated results originate from the quantitative data (Creswell, 2009:211).

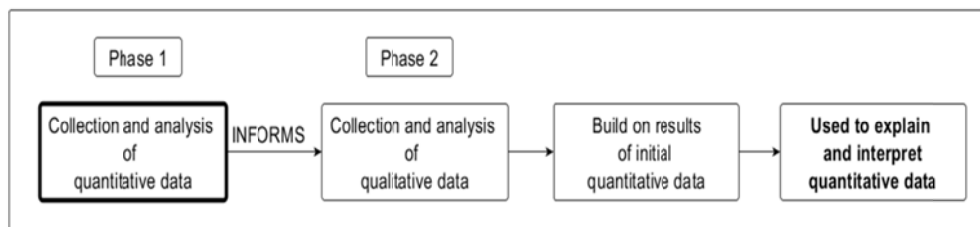


Figure 4.3: Sequential explanatory strategy
(Source: Creswell, 2009:211)

4.3.6.2 Sequential exploratory strategy

This strategy is used to explore phenomena and is characterised by initial qualitative data collection and analysis followed by quantitative data collection and analysis.

Key to this strategy is that quantitative analysis is used to aid with the interpretation of the initial qualitative data collected (Creswell, 2009:211).

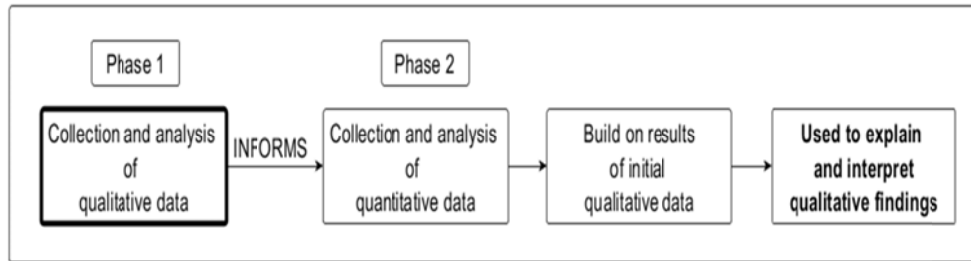


Figure 4.4: Sequential exploratory strategy
(Source: Creswell, 2009:211)

4.3.6.3 Sequential transformative strategy

This approach draws on aspects from the previously mentioned strategies but is fundamentally driven by a theoretical framework which translates into a strategy that prioritises the theory and related objectives rather than the practical aspects of the research study (Creswell, 2009:213).

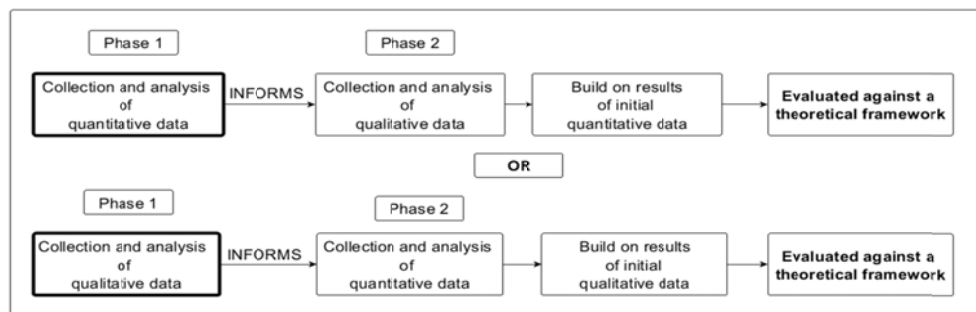


Figure 4.5: Sequential transformative strategy
(Source: Creswell, 2009:213)

4.3.6.4 Concurrent triangulation strategy

This method evaluates both quantitative and qualitative data, weighted equally, in order to determine whether relationships exist, such as similarities or differences, between these types of data sources (Creswell, 2009:213).

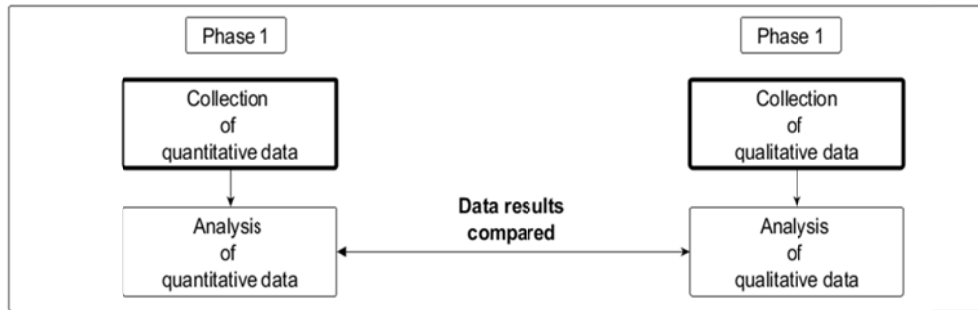


Figure 4.6: Concurrent triangulation strategy
(Source: Creswell, 2009:213)

4.3.6.5 Concurrent embedded strategy

In this strategy, both data types (quantitative and qualitative) are collected simultaneously as part of two types of methods employed as part of the research study. Each method has a specific purpose and ultimately works together and independently to achieve the research objectives (Creswell, 2009:214).

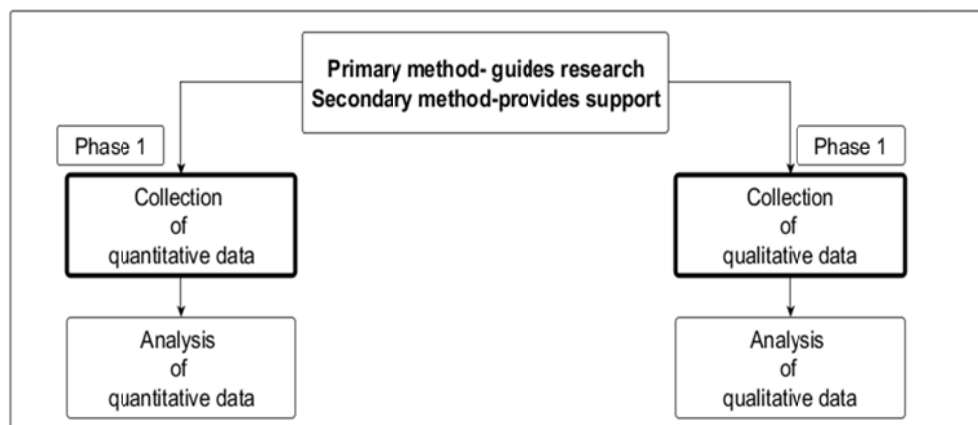


Figure 4.7: Concurrent embedded strategy
(Source: Creswell, 2009:214)

4.3.6.6 Concurrent transformative strategy

Key to this approach is the concurrent collection of both types of data. Similar to the sequential transformative approach, the theoretical framework is prioritised in relation to the practical aspects of the research study (Creswell, 2009:215).

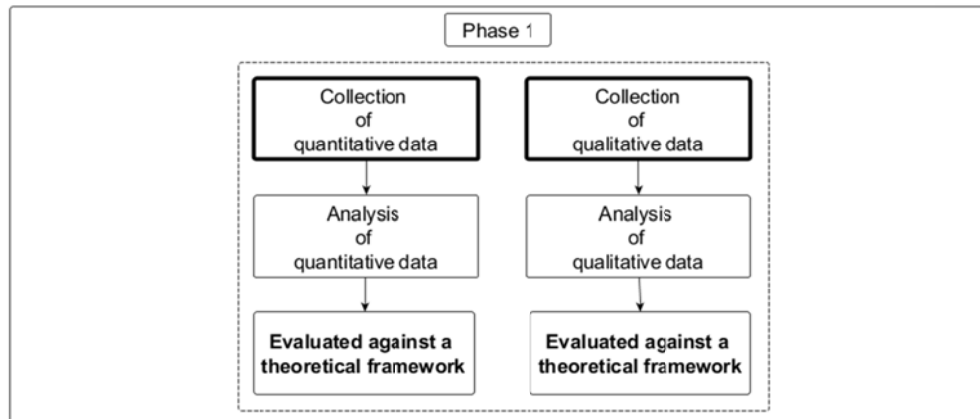


Figure 4.8: Concurrent transformative strategy
(Source: Creswell, 2009:215)

Having looked at the different strategies, Creswell (2009:216) recommended that the choice of strategy ultimately be guided by the individual research questions, considering items such as:

- Identifying the variables necessary to answer the research objectives.
- Determining whether the variables to be measured are either quantitative, qualitative or both.
- The practicalities of finding the answers to the various questions by considering all kinds of resources.
- And finally determining which approach would provide the most valuable, insightful information to the research questions.

4.3.7. Survey Research

According to Blaxter, Hughes and Tight (2006:76) citing Aldridge and Levine (2001), survey research is a research strategy used to gather information and analyse information retrieved using the same questions from a number of parties/individuals. The data collected whether qualitative or quantitative, during a survey type research may vary and is dependent of the type of questions being asked during the survey, whether open-ended or closed ended. The strengths related to this type of study include: repeatability; provision of results that may be generalised if sample size is adequate; retrievability of a considerable amount of data in a short space of time. A noted limitation of this approach includes misinterpretation of questions by respondents.

As part of reviewing the survey research type, an acknowledged research method, the Delphi technique, was identified. It is this technique that will be discussed next.

4.3.8. Delphi technique

Turoff and Linstone (2002:**Online**) as part of an enquiry which evaluated the techniques and applications associated with the Delphi technique, provided insight regarding this research method. The authors provided the following basic purpose of the Delphi technique,

“Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.”

According to Turoff and Linstone (2002:**Online**), there are two types of Delphi techniques. The first type known as the conventional Delphi, collects data via “hard-copy” survey types and feedback is evaluated by individuals. The second type is known as real-lucre Delphi, incorporates the use of programmed computers to generate and evaluate the surveys used as part of the evaluation.

The application of the Delphi technique, according to Turoff and Linstone (2002:6:**Online**), is usually employed in instances when the following needs arise:

- Where analytical techniques may not provide a solution to the problem being investigated.
- The problem under investigation is a complex problem and warrants the participation and contribution from individuals to facilitate the resolution of the problem.

Similarly, Skulmoski, Hartman and Krahn (2007:**Online**) citing numerous sources explained that the Delphi technique is an effective and efficient research method able to facilitate the following:

- Provides a framework for group communication aimed at solving a problem (Linstone & Turloff, 1975).
- Provides a strategy to aid decisions (Rowe & Wright, 1999).
- Aid in collecting information about a problem or concept under investigation (Adler & Ziglio, 1996; Delbeq et al., 1975).

The technique basically consists of a number of iterations of questionnaires administered to a selected group of individuals with the objective of developing agreement about a specific subject in order to resolve a common problem (Ludwig (1994) cited by Hsu and Sandford, 2007:2:**Online**).

Similar to the view offered by Hsu and Sandford (2007:**Online**), Linstone and Turoff (2002:4:**Online**) supports the outcome of potentially solving a complex problem using the Delphi technique. Inaki, Landin and Fa (2006:815:**Online**) also supported the previous statements regarding the intent of employing the Delphi technique as follows: to identify differences of opinion and reaching consensus amongst individuals in a group about an area under discussion.

Contrary to the purpose of consensus building, offered thus far, Skulmoski, Hartman and Krahn (2007:9:**Online**) citing Lecklitner (1984) indicated that the Delphi technique may also be used to determine and

understand the opinions and thoughts of the participants related to a particular topic without aiming to achieve consensus.

Hsu and Sandford (2007:6:**Online**), also shared possible challenges related to the Delphi technique which included the following:

- Low response rate.
- Time consuming.
- Researcher bias.
- Variation in expertise knowledge.

In order to adopt this research method, the following aspects should be considered, to ensure valid and reliable data and ultimately credible conclusions (Skulmoski, Hartman & Krahn (2007:10-12:**Online**):

- Methodological Choices and methodological Rigor.
- Initial Question – Broad or Narrow.
- Number of Participants.
- Number of Rounds
- Mode of Interaction.
- Expertise Criteria.

Aspects related to expertise criteria, was deemed particularly critical for a successful Delphi evaluation. For this reason, the key requirements in this regard has been captured below (Adler & Ziglio (1996) cited by Skulmoski, Hartman & Krahn (2007:10:**Online**):

- Knowledge and experience related to the topic.
- Willing participants.
- Availability to participate in the various iterations.
- Effective communication skills.

4.4. SELECTING AN APPROPRIATE METHODOLOGY

Before selecting a research approach, a closer look at the specifics needed for achieving the research objectives was evaluated. Since the purpose and objective of the research study was: to explore and describe the practice amongst auditors when rating audit findings; potentially identify reasons for inconsistencies amongst auditors when rating findings;

and provide recommendations to improve both the consistency amongst auditors when rating audit finding and the overall performance of the audit process, the Delphi technique with elements of a sequential exploratory strategy, seemed like a probable choice for a research method. The reasons for adopting the particular research approach are noted next.

The choice is supported by literature in the following way. Paliwoda (1983:33:**Online**) and Vakani and Sheerani (2012:21:**Online**), recommended the technique be employed to solicit the opinions and perceptions from subject matter experts. By using the technique, which is identifiable by anonymous input, psychological barriers to sharing are removed; and lateral thinking is enhanced, in the participating individuals. Individuals are therefore free to share opinions even if these are contrary to the opinions held by a larger group.

In addition, selecting the Delphi technique allows for the following (Paliwoda,1983:33:**Online** and Vakani and Sheerani, 2012:21:**Online**):

- All participants would be at liberty to express their opinions.
- Dominant and verbose individuals would not dominate the intervention, leading to the introvert being silenced.
- Individuals would not feel obliged to agree with the majority, avoiding “group think”.

Similar to the opinion noted by Paliwoda (1983:33:**Online**); Vakani and Sheerani (2012:21:**Online**); and Hartman and Krahn (2007:9:**Online**) citing Lecklitner (1984), the anonymity and controlled feedback elements of the method, encourages creative thinking amongst the participants and enables a realistic reflection of a complex situation to be discovered.

On the other hand, since the purpose and objective of the research study is to explore and describe the practice amongst auditors when rating audit findings in the quality assurance department, one of the mixed method strategies also qualifies as a suitable approach, namely the sequential exploratory strategy (Creswell, 2009:212).

The reasons for possibly adopting the sequential exploratory strategy are as follows:

- Research which has an exploratory purpose.
- Research where a multi-phase approach is adopted.
- The use of quantitative data and associated analysis to provide insight related to qualitative findings.

Since the sequential exploratory strategy aims to explore a phenomenon, through initial qualitative data collection and analysis followed by quantitative data collection and analysis, a noted advantage is the ability to use quantitative data to support qualitative data making the qualitative findings easier to defend and accepted by critics (Creswell, 2009:212).

Therefore after considering the options available, the Delphi technique with elements of a sequential exploratory strategy (mixed method methodology) seemed like an appropriate choice.

4.5. INSTRUMENTS EMPLOYED: OBSERVATION TECHNIQUES

Since the Delphi technique consists of a number of iterations of questionnaires administered to a selected group of individuals, the primary instrument used as part of the study would include questionnaires (Ludwig (1994) cited by Hsu & Sandford, 2007:2:**Online**). In addition, historical data will also be employed as part of the study.

The various types of questionnaires habitually employed as part of research studies were evaluated and listed as follows (Babbie, 2010:**Chapter 9** and Blaxter, Hughes & Tight, 2006:181):

- Category.
- List of multiple choice options.
- Scale.
- Open ended questions.
- Complex grid or table.

It was decided to employ the following questionnaire types in the current study:

- Scale.
- Ranking.
- Open ended questions.

Even though the researcher initially entertained the use of a focus group intervention for the purpose of data collection, after reviewing the advantages and disadvantages of the Delphi technique, the researcher settled on using this method instead.

4.6. SAMPLING AND SELECTION

Blaxter, Hughes and Tight (2006:165), returned that the type of sampling decided upon is generally influenced by the knowledge of the participants involved as well as the resources available, which may include time.

For this research study, all members of the quality assurance department was selected to participate in all stages of the research study. However, wherever the whole population could not be accessed, voluntary/ simple random sampling was applied (Blaxter, Hughes & Tight, 2006:163). In addition, the audit finding data used as part of the research study was selected from historical data for the period, 2008-2010.

4.7. DATA TYPE, MEASUREMENTS AND VARIABLES

Babbie (2010:131) returned that critical to succeeding in the empirical phase of a study, is the identification of the specific indicators, which would reveal the presence or absence of the concept under investigation.

Similarly, Mouton (2001:99-110) encouraged researchers to identify and select the data sources wisely, being aware of issues that may arise due to the data type chosen. Mouton systematically highlights common errors that may require consideration as part of the data collection process which will be discussed in the subsequent sections:

- Data validity.
- Data reliability and trustworthiness.

4.7.1. Data validity

Answering all the research questions and successfully completing a study; requires constant evaluation and verification of the data collected throughout the study. It is the role of the researcher to constantly evaluate whether the research objectives will be met and whether the research questions will be answered. For this reason, data collection by multiple means followed by accurate and appropriate analysis is required. Besides the identified indicators, the instrument used to measure the indicators also requires consideration (Welman & Kruger: 2001:136). This area was covered in Section 4.5 of this chapter.

As part of the data collection process, the validity of the data collected would be checked before and after the data collection activity.

4.7.2. Data reliability and trustworthiness

Mouton (2001:106) also noted common errors applicable in data collection which require attention in the study. These considerations included:

- Researcher distortion.
- Researcher expectancy effect.

Common errors will be elaborated on in Chapter 5. In the section that follows however, the specific data type, measurements and variables will be discussed.

4.8. OPERATIONALISATION

Operationalisation is considered the practical undertaking of the research study and refers to the actions and measurements required to meet the research objectives, and include (Babbie, 2010:116):

- **Measuring Instrument:** Different types of questionnaires.
- **Data Source:** This requires identifying the indicators that would signal the presence/absence of a concept. It is also important to question the reliability, accuracy and value-adding aspects of the data source once identified.

- **Data processing:** This refers to the actions to be taken once data has been collected and generally necessitates calculations.
- **Analysis:** As part of this step, data and associated calculations are evaluated in order to obtain insight.
- **Application/Interpretation:** Is the collective actions which culminates in a research finding being documented.

The generic approach adopted for each research question will follow the operationalisation as depicted in Figure 4.9.

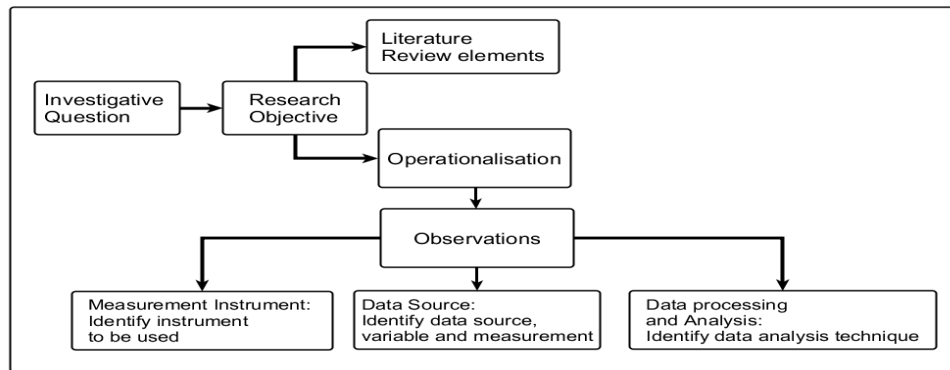


Figure 4.9: Operationalisation methodology employed
(Source: Own source)

4.8.1. What elements affect the effectiveness of the QMS audit process?

Besides the key learning noted from the literature study, it was deemed practical to perform a Delphi evaluation as part of the operationalisation stage for the following reasons:

- Determine the opinions of the current auditors related to aspects of audit effectiveness.
- Determine whether inconsistencies existed amongst auditors in this regard.
- If inconsistencies existed, attempted to reduce any inconsistency amongst auditors.

“What elements affect the effectiveness of the QMS audit process?”

This question formed the basis of the Delphi evaluation at this stage while Figure 4.10 depicts the detail action required to answer the specific research question.

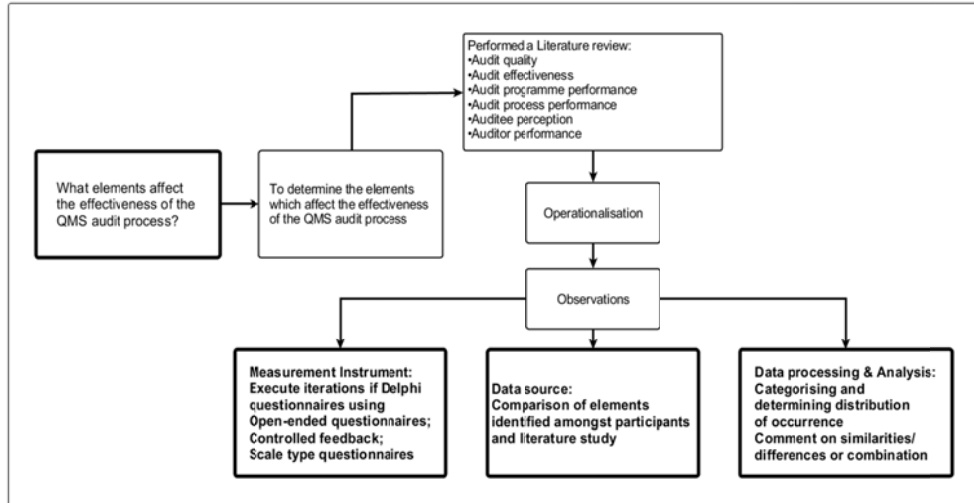


Figure 4.10: Operationalisation for research question 1

(Source: Own source)

4.8.2. How can the level of objectivity exercised by an auditor be improved when rating audit findings?

The actions associated with the Delphi technique used to examine this research question have been depicted in Figure 4.11.

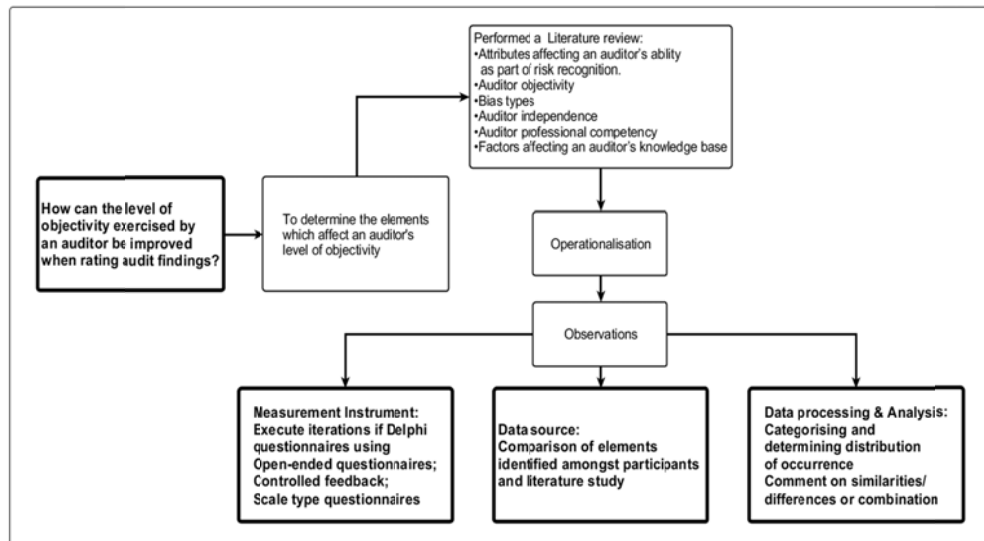


Figure 4.11: Operationalisation for research question 2

(Source: Own source)

Besides the key aspects noted from the literature study, the Delphi evaluation was chosen so that perceptions amongst participants with regards to this topic could be evaluated. As part of this process, the open-ended question below formed the basis of the evaluation,

“What elements affect the objectivity of an auditor?”

4.8.3. Are specific risks consistently identified and considered when formulating audit findings?

Two empirical actions would be performed at this stage. The first survey, the Delphi evaluation, will be used to determine the opinions related to the purpose of rating audit findings by asking the following question,

“Why do QA auditors rate/grade audit findings?”

While the purpose of the second survey was to determine the criteria applied during the formulation of a high; medium; and low rated findings by asking the following open-ended question,

‘Which criteria/considerations would you use when rating the following types of findings: High, Medium and Low?’

The operationalisation step for this research question was depicted in Figure 4.12.

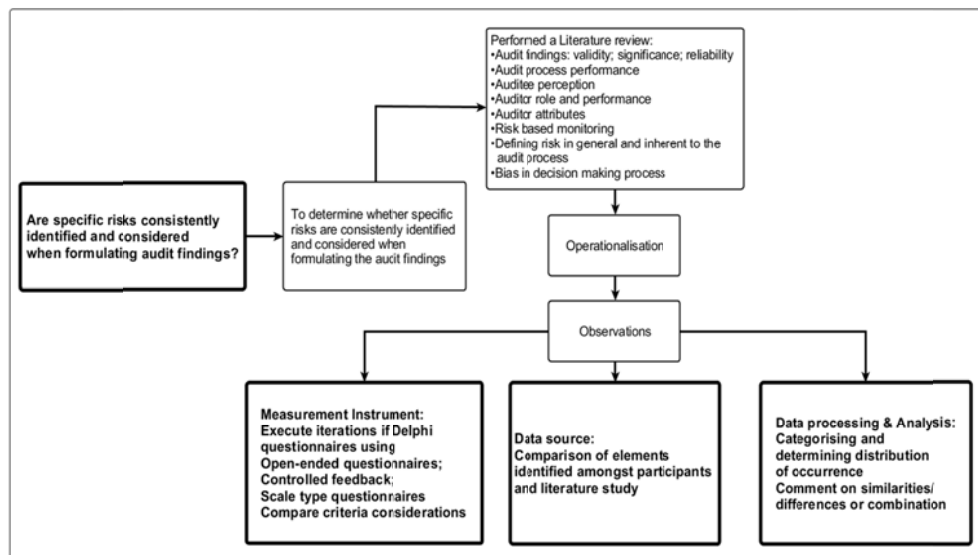


Figure 4.12: Operationalisation for research question 3

(Source: Own source)

4.8.4. Are specific risks consistently identified and considered when rating audit findings?

In addressing this research question, once again two empirical actions will be executed. The Delphi evaluation technique was used to determine the opinion amongst participants related to the reasons for variations amongst auditors and audit teams when rating audit findings. The basis of the evaluation stemmed from the question below,

“What elements contribute to auditor/ audit team variability?”

Secondly a risk ranking exercise will be administered in order to determine whether risk categories were considered and ranked consistently amongst the participants. In summary, Figure 4.13 depicts the empirical actions required to answer the specific research question.

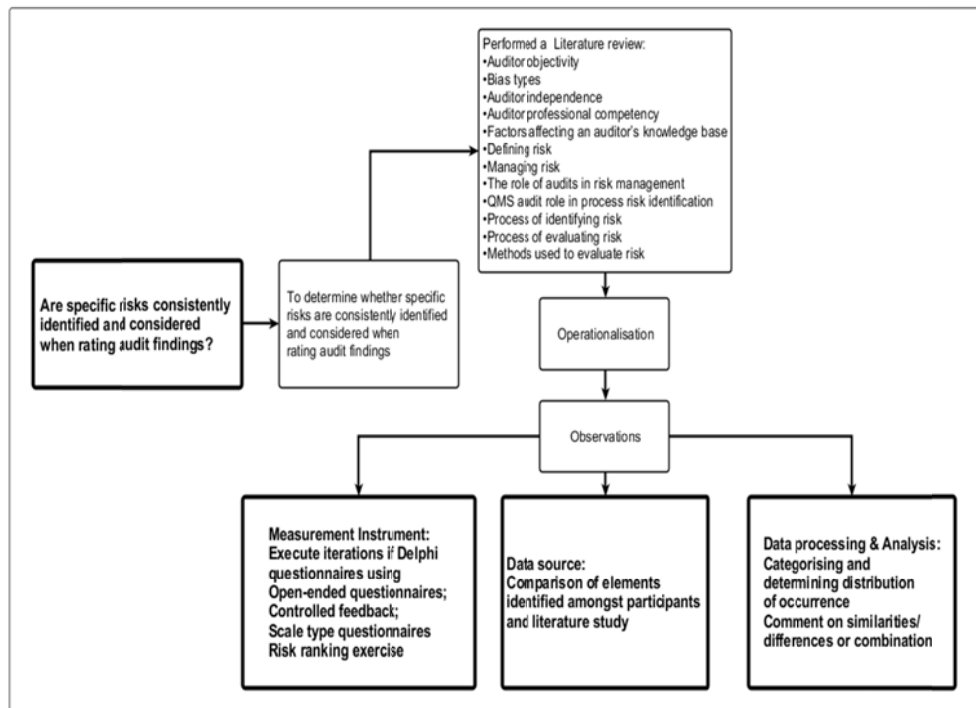


Figure 4.13: Operationalisation for research question 4

(Source: Own source)

4.8.5. What elements influence the consistency amongst auditors when rating audit findings?

In order to address this particular research question, the guideline noted in Figure 5.14 was adopted. Three distinct activities have been depicted and will be used to answer the research question. These activities include: the Delphi evaluation; an applied elements survey; and a rating survey.

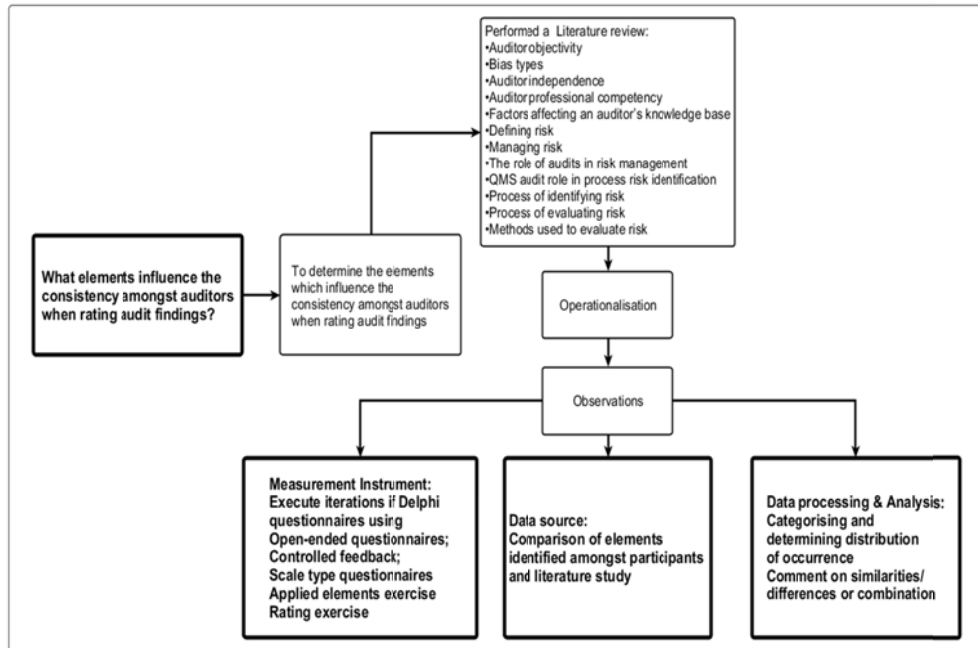


Figure 4.14: Operationalisation for research question 5

(Source: Own source)

The intent of the Delphi evaluation was to determine the perceived shortcomings related to the audit rating criteria. The question administered as part of the research question read as follows,

“What are the current shortcomings with the current rating criteria?”

Next the aim of the applied element survey was to explore whether additional elements influenced the consistency amongst auditors when rating QMS audit findings.

And finally, the aim of the rating survey was to assess whether variation occurred amongst participants when rating audit findings.

4.8.6. Primary research question and associated objective

How will the audit process and the associated outcomes be affected by improving the consistency amongst auditors when rating individual audit findings?

In order to answer the primary research question and meet the primary research objective, it was decided to perform an exploratory research study using both qualitative and quantitative data, thereby answering the primary research question and meeting the primary research objective by means of interpretation and acceptable inference.

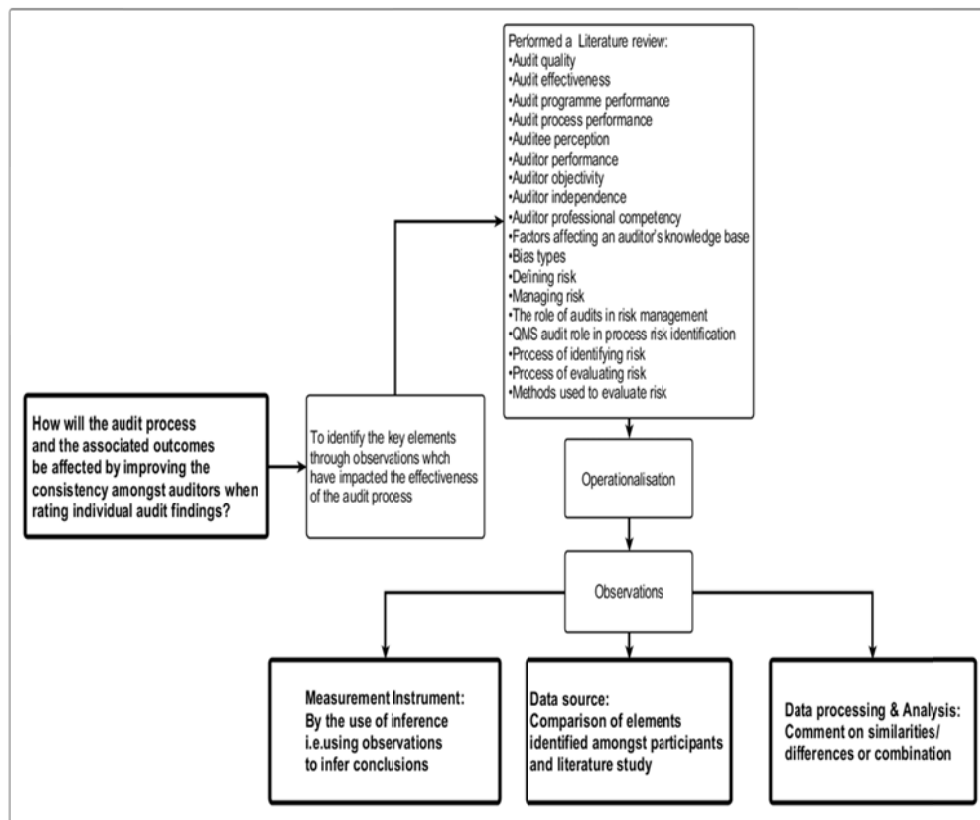


Figure 4.15: Operationalisation for the primary research question

(Source: Own source)

At the operationalisation level (Figure 4.15) an extensive literature study was performed and both the qualitative and quantitative data collected as part of the observations would be reviewed in order to meet the overall research objective.

4.9. RESEARCH ASSUMPTIONS

Walliman (2010:15-16) returned that research consists fundamentally of collecting data and information, interpreting this data and information, and subsequently developing an understanding of a particular concept in order to acquire knowledge. In addition, researchers perceive situations through their own experiences, and make assumptions which are able to influence the manner in which the specific research is performed.

The following assumptions have been identified for the study:

- Auditors participating in the study are all suitably qualified and competent.
- Auditors participating in the study have all been exposed to equivalent induction programmes.
- Auditors participating in the study are all willing participants.
- Auditors participating in the study perceive the research study in a positive light.
- The use of historical data, particularly the words used in the description of findings, as part of the research study is considered not to impact negatively on the research study.

4.10. RESEARCH CONSTRAINTS

Welman and Kruger (2001:107-108) relayed that participants are generally biased and partial by nature and therefore involving participants in a research study always poses a risk to the outcome of the research study. In the study the '*subject effect*', has been identified and refers to how participants are affected by other aspects of the research study outside of the researcher's control. As part of the '*subject effect*', Welman and Kruger (2001:108) identify a tangible constraint to be considered as part of the proposed study noted below,

"If the research participants are familiar with the research hypothesis they may consciously or unconsciously act in such a manner that their behaviour facilitates the confirmation of the hypothesis."

In addition, Welman and Kruger (2001:79) averred that research performed in a workplace environment; usually results in a situation where the researcher is unable to control all interventions to which participants are exposed. However, being aware of possible challenges allows the researcher to circumvent such burdens by implementing elements of control.

4.11. CONCLUSION

The overall intent of this chapter was to elaborate on the collective approach used during the design phase of the research study; indicating the choice of research methodology; as well as deciding on the empirical actions to be adopted during the research execution phase. Based on this objective, the overall intent of the chapter has been met.

In summary, it was decided to adopt the Delphi Technique along with elements of a sequential exploratory strategy (mixed method methodology). Furthermore, by dissecting the method needed to meet each research objective, it was possible to identify the data sources, variables, measurements and the necessary observation techniques needed at each stage of the study. This information provided the foundation for Chapter 5, where the following will be captured: all the data collected; processed; analysed and interpreted in order to meet the research objectives and answer the related research questions.

CHAPTER 5: DATA COLLECTION, ANALYSIS AND INTERPRETATION OF RESULTS - AN ALTERNATE METHODOLOGY FOR RATING AUDIT FINDINGS

5.1. INTRODUCTION

In this chapter, all the data collected, processed, analysed and interpreted will be considered in greater detail in order to meet the identified research objectives and answer the related research questions. For this reason the emphasis will be on the highlighted areas as noted in Figure 5.1.

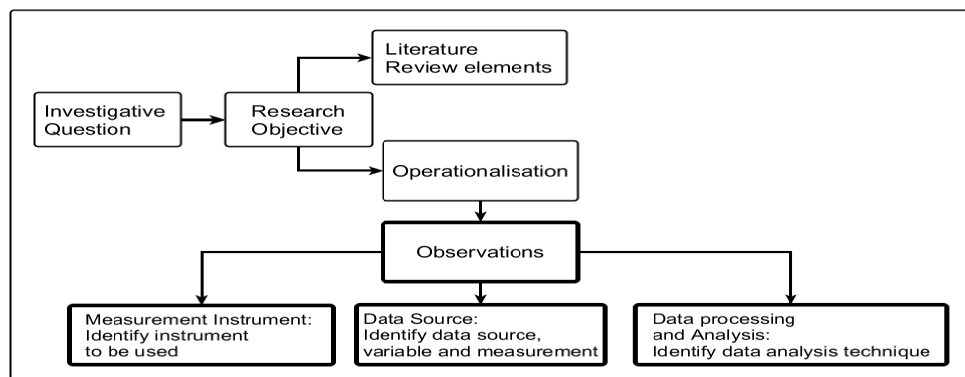


Figure 5.1: Focus areas for Chapter 5
(Source: Own source)

As part of the process of data collection, analysis and interpretation, quantitative measures was employed to endorse the initial qualitative data collected. The employed Delphi evaluation technique supported this intent, closely mimicking the sequential exploratory strategy depicted in Figure 5.2.

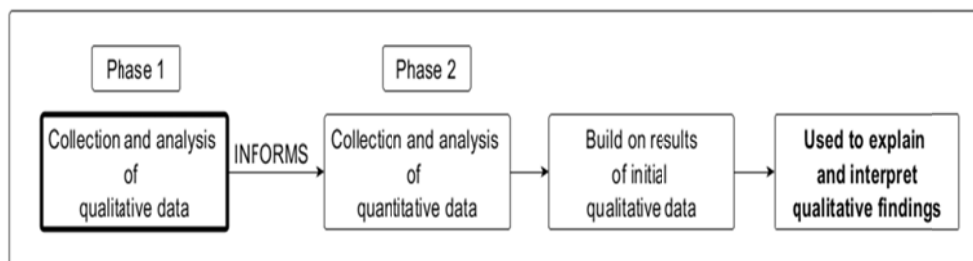


Figure 5.2: Sequential exploratory strategy
(Source: Creswell, 2009:211)

To abet meeting the overall purpose of the chapter, the following general aspects will be discussed, as related to data collection in research, before the actual data collection and analysis processes are reported:

- Execution of qualitative research.
- Research quality.
- Qualitative data analyses.

5.2. EXECUTION OF QUALITATIVE RESEARCH

The purpose of qualitative research is commonly exploratory in nature. Usually characterised by unstructured data collection techniques from which comprehensive knowledge and perspective may be gleaned, if effectively analysed (Maxwell (1997) cited by Sinkovics, Penz & Ghauri, 2005:11:**Online**).

Baptiste (2001:**Online**) supported the importance of effective data analysis and highlighted that many qualitative data analysis (QDA) strategies existed which could be employed within qualitative research. Choosing an appropriate strategy however depended on: the overall objective of the research study; as well as the specific intent of the data collected and the associated analysis. Furthermore, the importance of constant re-evaluation of the adopted strategy to ensure data analysis objectives are met was also pointed out.

5.3. RESEARCH QUALITY

Due to the nature of qualitative research and the associated analyses, one of the most prevalent criticisms of this type of research is related to the perceived lack of reproducibility, reliability and validity. Consequently, for qualitative research studies to be acceptable, researchers delving into this type of research would be required to demonstrate research quality in relation to data validity and data reliability which would ultimately impact on the credibility of the research conclusions (Sinkovics, Penz & Ghauri, 2005:12:**Online**).

Relating to research credibility, Leedy and Omrod (2005:154) indicated that researchers of qualitative studies are required to provide evidence of using methods which denote accuracy, precision and thoroughness. And by providing the required evidence of accuracy, precision and the performance of due diligence, proof of rigor and objectivity as part of the research study, may be provided.

In addition, Leedy and Omrod (2005:154) citing numerous sources (Altheide and Johnson, 1994; Creswell, 1998; Eisner, 1998; Gall, Borg and Gall, 1996; Glaser, 1992; Howe and Eisenhardt, 1990) offered guidelines and indicators by which to assess the quality of the qualitative research. These attributes included: purposefulness; explicitness of assumptions and biases; rigor; completeness; coherence; persuasiveness; consensus.

Similarly, Babbie (2010:416-417) citing Britain's National Centre for Social Research, proposed questions to be used to evaluate qualitative research. A sample of these questions has been recorded verbatim in Table 5.1.

Table 5.1: Sample of questions used to evaluate qualitative research

(Source: Britain's National Centre for Social Research, n.d. cited by Babbie, 2010:416-417)

	Evaluating question
1	How credible are the findings?
2	How clear is the basis of evaluative appraisal?
3	How defensible is the research design?
4	How well was the data collection carried out?
5	How well are the contexts of data sources retained and portrayed?
6	How clear and coherent is the reporting?
7	How adequately has the research process been documented?

Augmenting the topic of research quality, Lacey and Luff (2007:26:Online) proposed ways to demonstrate rigor in relation to data validity and reliability of a research study. These approaches were discussed in the subsequent sections:

- Reliability.
- Validity.
- Triangulation.

- Researcher perspective.
- Respondent validation.

5.3.1. Reliability

According to Lacey and Luff (2007:26:**Online**), reliability is related to the methods employed throughout the process of data collection and data analysis. To achieve the required reliability, the authors suggested the following steps be followed:

- Specify the approach and method adopted for data analysis.
- Substantiate and provide reasons for the choice of method in relation to the research environment and context.
- Specify the rationale employed in identifying the themes and categories chosen as part of the data analysis and ensure the rationale stands up to examination.
- Finally use reputable literature sources to support adopted methodologies.

Baptiste (2001:**Online**) recommended the same steps as noted above. While Alam (2005:108:**Online**), encouraged researchers to specify clearly all the steps performed during the research study to enhance credibility of qualitative research.

5.3.2. Validity

Lacey and Luff (2007:27:**Online**) returned that validity relates firstly, to the degree of accuracy in collecting and presenting data. And secondly, to the truthful interpretation of the data collected and the associated data analysis.

Alam (2005:107:**Online**) offered the concept of “chain of evidence” as part of achieving research validity. As part of this process, the researcher’s reasoning is traced from the start of the research concept to the point of conclusion. Correlation is noted to the concept of reflexivity as mentioned by Lacey and Luff (2007:28:**Online**) in the discussion of researcher perspective noted in an upcoming section.

5.3.3. Triangulation

Triangulation is another method noted in literature used to exhibit reliability and validity. Lacey and Luff (2007:27:**Online**) explained the concept as follows,

“Triangulation means gathering data from more than one source to gain a fuller perspective on the situation”.

Alam (2005:104:**Online**) citing Yin, (1994) and Miles and Huberman (1994), specifically speaks of *“triangulation of evidence”* and denotes the use of multiple data sources. In addition, Alam (2005:107:**Online**) also highlighted the approach of collecting information from multiple respondents.

Whereas Jack and Raturi (2006:345:**Online**), referred to triangulation as an approach where multiple methods are used to evaluate a single concept. An opinion supported by Jonsen and Jehn (2009:125:**Online**).

From the sources noted above, it becomes clear that a number of triangulation types exist. Mangan, Lalwani and Gardner (2004:569:**Online**) citing Hussey and Hussey (1997) explained the various types of triangulation methods noted in research. For ease of reference, these types have been tabulated verbatim in Table 5.2.

Table 5.2: Types of triangulation

(**Source:** Mangan, Lalwani & Gardner (2004: 569:**Online**) citing Hussey & Hussey (1997)

Triangulation type	Description
Data triangulation	Where data are collected at different times or from different sources
Investigator triangulation	Where different investigators independently collect data
Methodological triangulation	Where both quantitative and qualitative techniques are employed
Triangulation of theories	Where a theory is taken from one discipline and used to explain a phenomenon in another discipline.

Mangan, Lalwani and Gardner (2004:569:**Online**) once again citing Hussey and Hussey (1997) claimed that applying triangulation, mitigates

bias and weaknesses inherent in all researchers and research methods, promoting data validity and reliability.

Jack and Raturi, (2006:345:**Online**) affirmed the same purpose for triangulation in mitigating risk and combatting inherent subjectivity of various research methods. This opinion was also shared by Jonsen and Jehn (2009:125:**Online**).

5.3.4. Researcher's perspective

To ensure the credibility of a qualitative research study, due diligence is needed to mitigate the effects of researcher bias. Researcher bias could stem from either: a researcher's worldview; values; or even the type of engagement between the researcher and research participants. Baptiste (2001:**Online**) recommended that researchers continuously re-examine reasoning during all phases of the research activity to counter the effects of researcher bias.

Besides a reflective questioning attitude, a sound knowledge and awareness of research fundamentals; will stand the researcher in good stead in striving for objectivity. These concepts include:

- Ontology.
- Epistemology.
- Methodology.

Simply stated by Sobh and Perry (2006: 1195:**Online**), these concepts in relation to methodology are as follows,

“Ontology is “reality”, epistemology is the relationship between that reality and the researcher, and methodology is the techniques used by the researcher to discover that reality.”

5.3.5. Respondent validation/ feedback

Lacey and Luff (2007:28:**Online**) alluded to providing and eliciting feedback to and from participants at various stages of the research to enhance research quality. Reasons for the feedback are two-fold. Firstly, verifying information captured and secondly, validating the researcher's

interpretation of data. Even though respondents' feedback may indicate research quality, Lacey and Luff warned that respondent intentions/biases may need to be considered by the researcher.

Finally in addressing research quality, Mouton (2001:106) warned against possible errors which may occur during the data collection process. Errors which may influence the success of a research study. A sample of such errors commonly experienced, has been recorded in Table 5.3.

Table 5.3: Common data collection errors

(Source: Mouton, 2001:106-107)

Common Errors	Description
Researcher distortion	Purposeful manipulation of the data and facts by the researcher
Research expectancy effect	Subtle communication by researcher to participant of expected research outcomes
Social desirability effects	Participants provide false feedback based on perceived social expectations
Demand characteristics	Participants provide false feedback based on perceived researcher expectations

It is acknowledged that the errors captured in Table 5.3 can potentially impact the quality of the current research. For this reason, adopting an appropriate qualitative data analysis (QDA) approach was seen as crucial for achieving research credibility. In the next section this topic was further evaluated and discussed.

5.4. QUALITATIVE DATA ANALYSES

Baptiste (2001:Online), provided a four step QDA method. The framework, captured in Table 5.4, identifies the key steps representing the QDA process. In addition, the purpose of each step has been captured, providing clarity regarding the QDA process.

Table 5.4: An overview of the four steps of QDA

(Source: Baptiste, 2001:Online).

Step	Description
Defining analysis	Recognising which data/ indicators would be required to achieve the research goals and objectives; determining the extent of information needed; evaluating and deciding on a sound method to capture, record, interpret and express all levels of information.
Classifying data	The emphasis is placed on tagging data as well as grouping the tagged data items in a manner that will enable the researcher to meet research objectives. Tagging is fundamental in QDA and may require revisiting from time to time to ensure that throughout the study appropriate labels or themes are used.
Making data connections	It is critical that researchers are able to link individual data types collected throughout the study. The linking of information creates the necessary context of the study and provides a holistic view which is important in establishing insights.
Relating meanings	Conveying or reporting the significance of the data collected remains the ultimate goal of the QDA and research studies in general. As part of this process, it is essential that the established context and the noted insights, which ultimately reflect the overall finding of the research.

5.5. DATA COLLECTION AND DATA ANALYSIS

As previously stated, the data collection process would require constant re-evaluation to ensure that accurate data collection, followed by appropriate analyses is performed. Ultimately leading to research questions being effectively answered (Lacey and Luff, 2007:28:Online).

As part of this study, the framework suggested by Baptiste (2001:Online) in Table 5.4 has been adopted. The stages of the QDA were translated into the process flow depicted in Figure 5.3.

In the framework, each research question and objective, with associated empirical actions, has been recorded. The intent of the framework, is to provide evidence of the steps followed needed to enhance the credibility of the qualitative research study (Alam, 2005:108:Online).

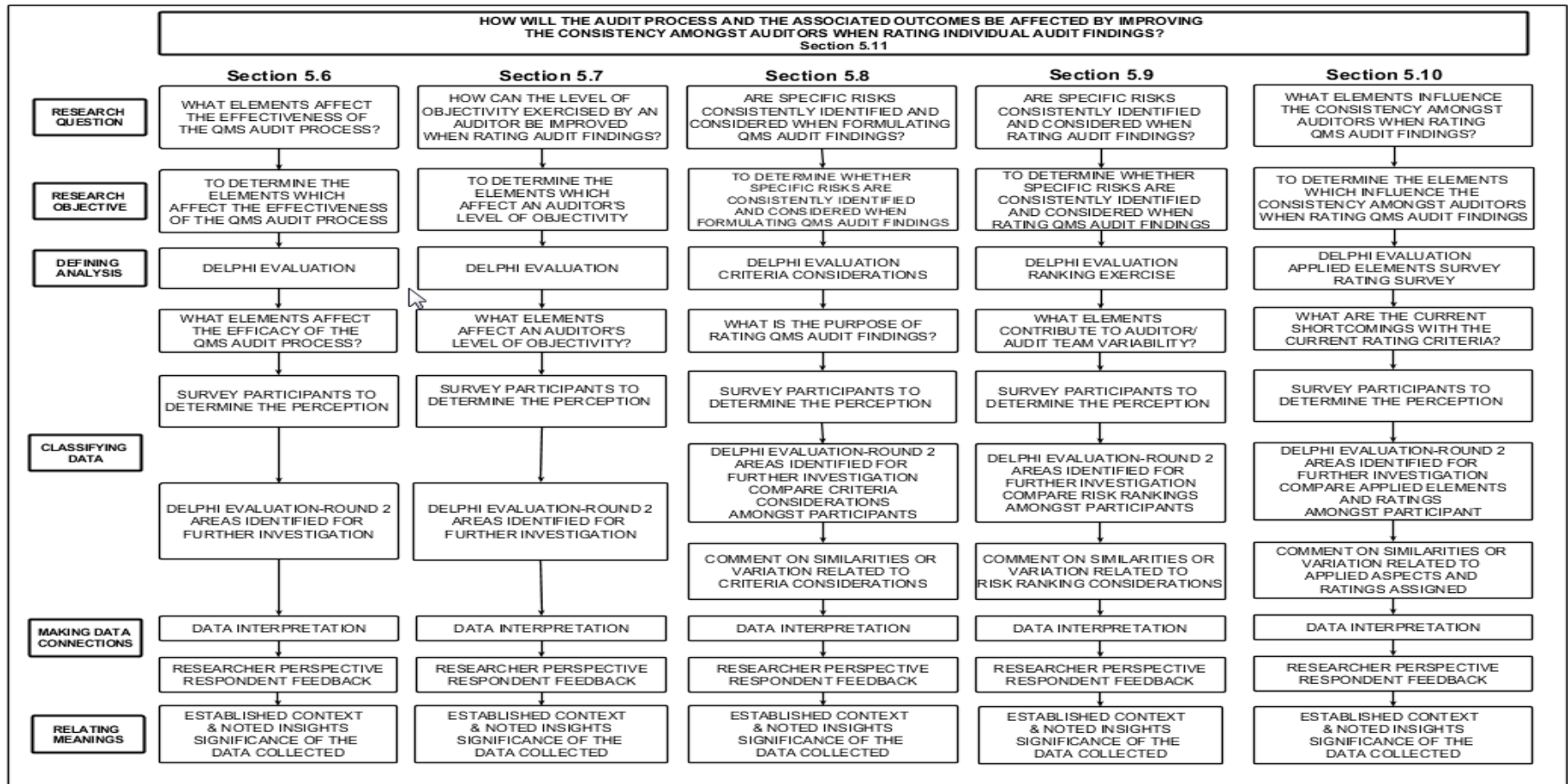


Figure 5.3: Applied research framework
(Source: Own source)

The framework depicted in Figure 5.3 mapped the actions associated with each research question and objective as follows (Baptiste, 2001:**Online**):

- **Defining the analysis:** The Delphi evaluation was employed for all research questions. For certain research questions, additional surveys were administered in order to meet the research objectives.
- **Classifying data:** As previously mentioned, this stage focuses on tagging data as well as grouping the tagged data items. As part of this process, key concepts identified during the literature review have been collected and depicted systematically in Figure 5.4. The concepts noted in Figure 5.4 were then used to code or tag the qualitative responses. By using Figure 5.4, objective and consistent tagging was ensured.
- **Making data connections:** This step is concerned with linking the individual data types as part of data analysis. The researcher's perspective is used to link and create context from one data source to another and possibly from one method to another. Where available, respondent feedback was also noted.
- **Determining related meanings:** Following on from the data connections, the researcher sought to provide the interpretation and significance of the data collected by means of the established context and the noted insights which are linked to the specific research objective and question.

In subsequent sections, each research question will be mapped in greater detail. The purpose of the additional detail is to provide evidence of reliability and validity as part of the methodology adopted (Lacey & Luff, 2007:26:**Online**). The structure noted above will also be used as the reporting framework. Therefore for each research objective, the following headings will be utilised:

- Defining analysis.
- Classifying data.
- Data connections.
- Related meanings.

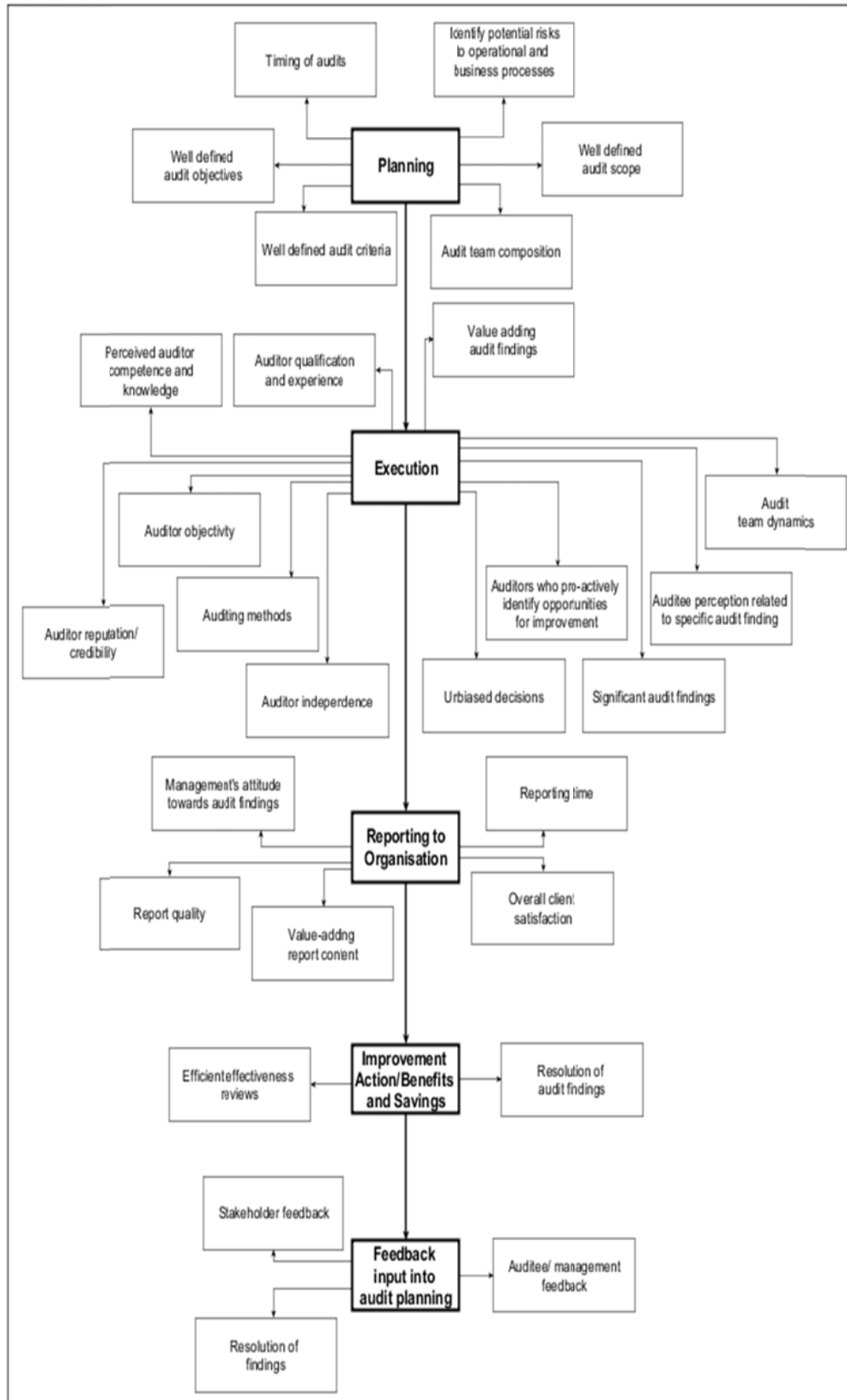


Figure 5.4: Elements affecting audit effectiveness used for classifying data
(Source: Own source)

5.6. WHAT ELEMENTS AFFECT THE EFFECTIVENESS OF THE QMS AUDIT PROCESS?

As part of exploring this particular research question and determining the elements which affect audit effectiveness, the methodology depicted in Figure 5.5 was adopted.

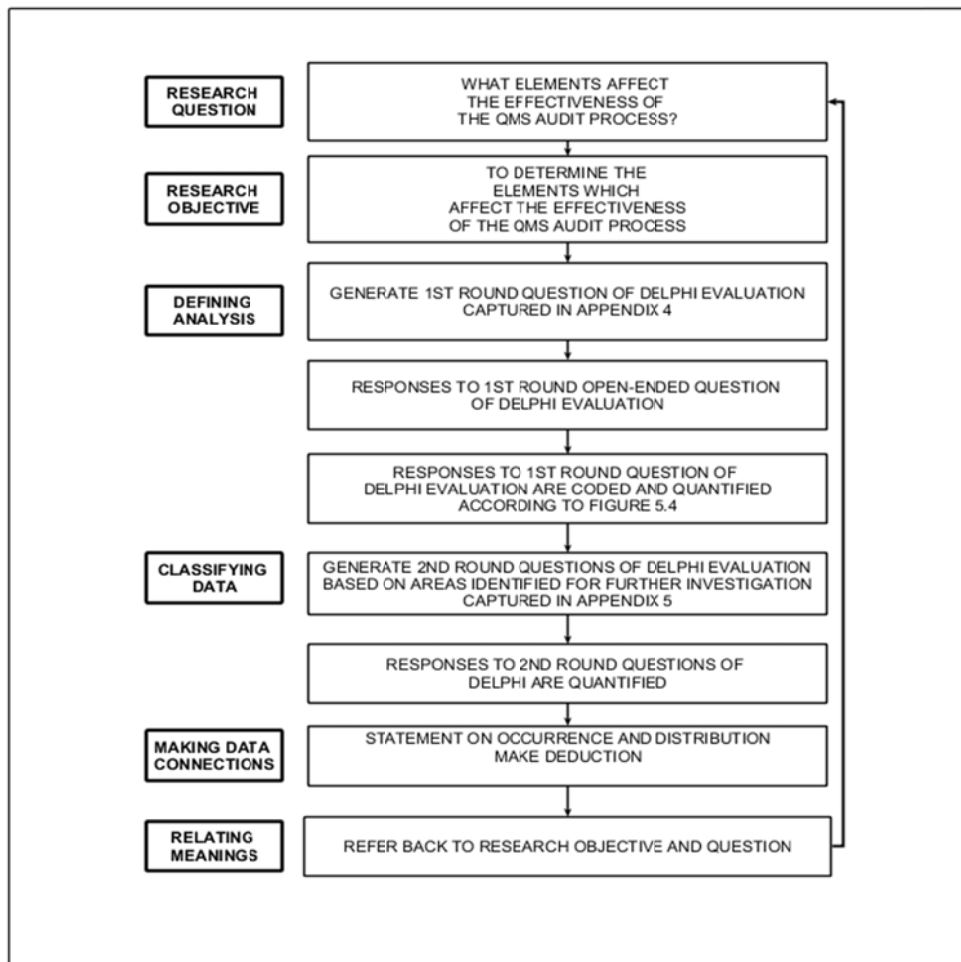


Figure 5.5: Research framework adopted for research question 1
(Source: Own source)

5.6.1. Defining analysis

The Delphi evaluation technique, consisting of two rounds, was adopted in the research study. As previously mentioned in Section 4.3.7 the Delphi technique may be used to determine and understand the opinions and thoughts of the participants related to a particular topic, whether similar or

different (Lecklitner (1984) cited by Skulmoski, Hartman & Krahn, 2007:9:Online). Since the primary purpose at this stage of the study was not to obtain consensus but rather determine participant's opinion and judgements, a third round of the Delphi evaluation, usually used for consensus building, was not executed.

As part of the adopted QDA process, respondent feedback was noted as a means of providing proof of data validity. Fortunately, the Delphi technique is identifiable by controlled feedback, and is therefore ideally suited for soliciting respondent feedback and validating the researcher's interpretation of data (Paraskevas & Saunders, 2012:919:Online; Howze & Dalrymple, 2004:175:Online; Paliwoda, 1983:33:Online).

The response rate for the first round and second round of the Delphi evaluation for the research study was noted at 55% and 60% respectively. In the sections that follow, the remaining steps noted in Figure 5.5 will be discussed.

5.6.2. Classifying data: Data collection; Analysis and interpretation

5.6.2.1 First round of the Delphi evaluation

➤ Data collection

Responses to the question below formed the basis of the data collection process at this stage,

“What elements affect the effectiveness of the audit process?”

➤ Analysis and interpretation

The individual responses captured in Appendix 10 were subsequently reviewed and tagged according to Figure 5.4. The frequency of occurrence of the various categories was verified and captured in Table 5.5.

Table 5.5: Data collected during round 1 of the Delphi evaluation

(Source: Own source)

Categories	Frequency	% Occurrence
Planning	3	60.00
Well defined audit objectives	1	20.00
Well defined audit scopes	3	60.00
Audit team composition	1	20.00
Auditor qualification and experience	1	20.00
Execution	1	20.00
Audit team dynamics	2	40.00
Significant audit findings	1	20.00
Management's attitude towards audit findings	1	20.00
Reporting time	2	40.00
Value adding report content	1	20.00

Once tagged, the categories were subsequently totalled for the quantitative representation noted in Figure 5.6.

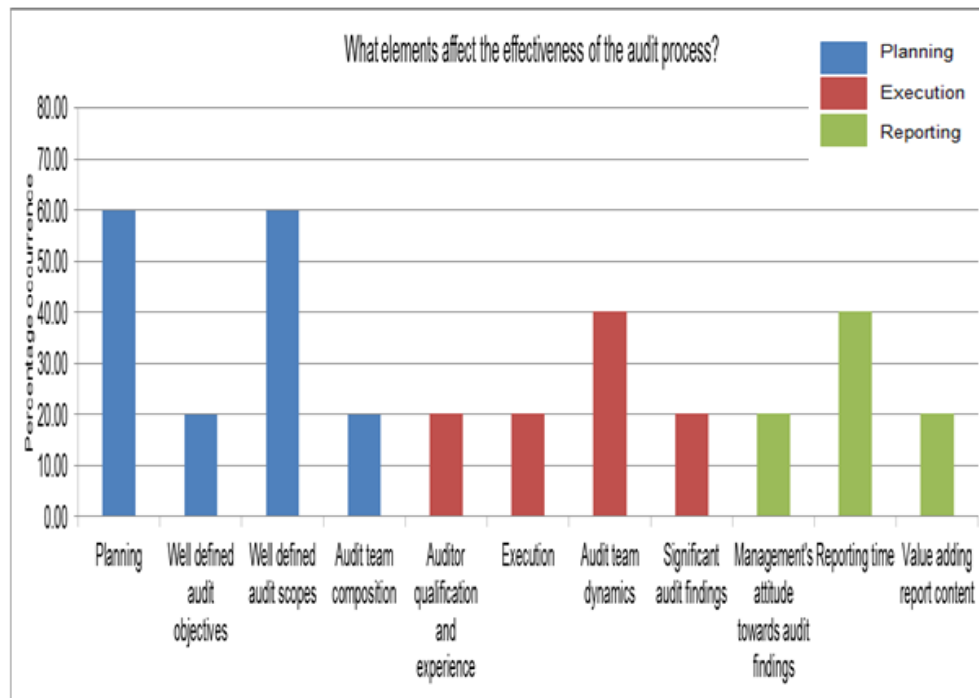


Figure 5.6: Round 1- Question 1

(Source: Own source)

The following salient points were noted as part of the data evaluation:

- The largest proportion of elements initially identified amongst the auditors, were pre-dominantly located in the planning phase of the audit process.
- The next four categories were located in the execution phase of the audit process.
- The elements noted from the reporting phase (the last three categories) were given least priority by the participants surveyed, except for the category related to reporting time.

5.6.2.2 Second round of Delphi evaluation

➤ Data collection

Following the analysis of data from round 1, a limited response was noted in the following areas, which has been identified for further investigation:

- Significant audit findings.
- Management's attitude towards audit findings.
- Value-adding report content.

The researcher aimed to determine the participant's perception in these noted areas by developing statements to determine opinions by means of a scale-type survey. The specific statements administered as this stage of the research were as follows:

- Significant audit findings can affect audit effectiveness.
- Value-adding report content can affect audit effectiveness.
- Effective resolution of audit findings can affect audit effectiveness.

The low scoring items identified in round 1 and related to the areas noted below would be evaluated in subsequent sections:

- Well defined audit objectives (see Section 5.11).
- Audit team composition (see Section 5.7).
- Auditor qualification and experience (see Section 5.11).

The results from the second round of the evaluation have been captured in Table 5.6.

Table 5.6: Data collected during round 2 of the Delphi evaluation

(Source: Own source)

Q1.1	Significant audit findings can affect audit effectiveness	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1				1	
	Participant 2	1				
	Participant 3		1			
	Participant 4		1			
	Participant 5	1				
	Participant 6		1			
	Total	2	3	0	1	0
	Percentage occurrence	33	50	0	17	0
Q1.2	Value-adding report content can affect audit effectiveness	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2			1		
	Participant 3	1				
	Participant 4		1			
	Participant 5			1		
	Participant 6		1			
	Total	1	3	2	0	0
	Percentage occurrence	17	50	33	0	0
Q1.3	Effective resolution of audit findings can affect audit effectiveness	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1					1
	Participant 2	1				
	Participant 3	1				
	Participant 4		1			
	Participant 5		1			
	Participant 6				1	
	Total	2	2	0	1	1
	Percentage occurrence	33	33	0	17	17

➤ **Analysis and interpretation**

The researcher evaluated the distribution of the responses noted in Table 5.6 and represented this information graphically in Figure 5.7; Figure 5.8; and Figure 5.9 respectively.

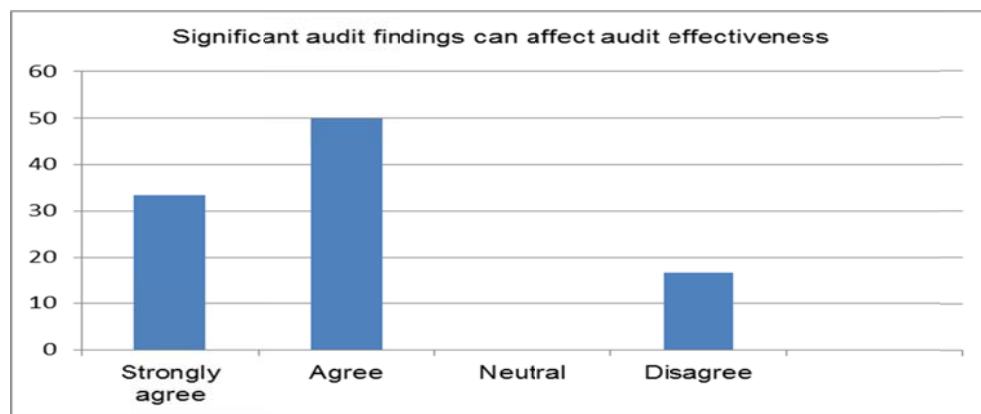


Figure 5.7: Round 2- Q1.1

(Source: Own source)

It was observed that 17% of the respondents did not agree that significant audit findings could affect audit effectiveness. While a total of 83% of the respondents acknowledged the importance of identifying significant audit findings and the impact it would have on audit effectiveness.

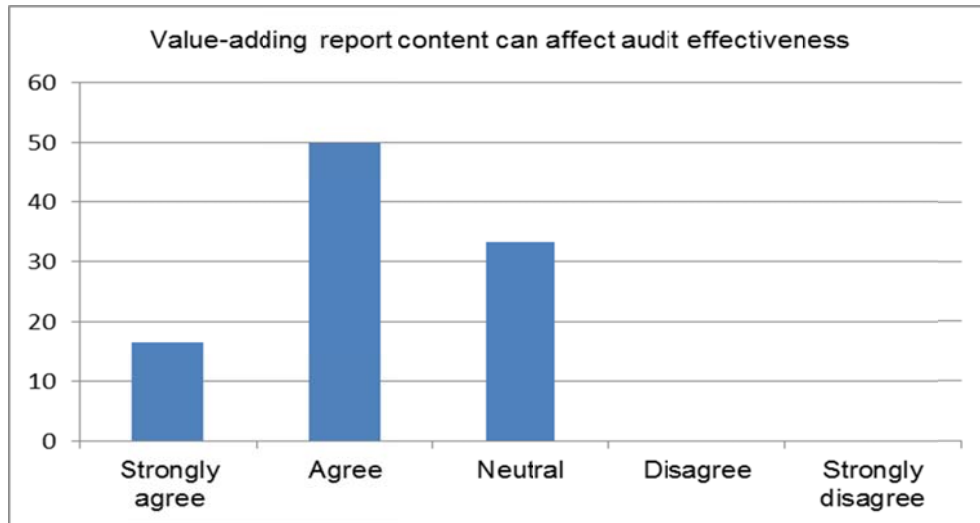


Figure 5.8: Round 2- Q1.2
(Source: Own source)

In response to the statement dealing with the impact that value-adding report content could have on audit effectiveness, only 67% of the respondents supported the statement, while 33% remained undecided regarding this statement.

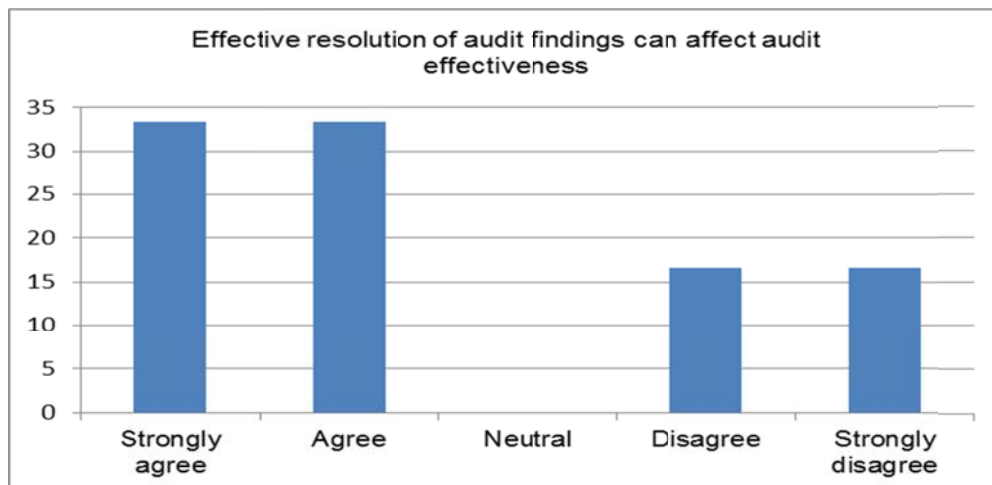


Figure 5.9: Round 2- Q1.3
(Source: Own source)

A minor fraction of the respondents (34%), did not agree that the resolution of audit findings could impact on audit effectiveness. With the remaining respondents (66%) indicating agreement with the statement.

5.6.3. Data connections: Researcher's perspective; Respondent feedback

The section on data connections will be re-visited during the evaluation of each research question and will consist of the following sections:

- Researcher's perspective.
- Respondent's feedback.

➤ Researcher's perspective

The results noted in phase 1 were unexpected due to the majority of respondents identifying elements in the planning stage of the audit as opposed to the execution phase, as predicted by the literature survey and anticipated by the researcher. From the results noted in this phase it can be deduced that respondents have a bias towards elements of audit planning and preparation when considering the influence on audit effectiveness.

The results noted in phase 2 were once again unexpected. The researcher expected a larger proportion of consensus to be reached in the area of resolution of audit findings and the quality of report content as positively impacting audit effectiveness. The researcher anticipated a proportion of neutral responses but did not foresee any of the participants disagreeing with the statements in Q1.1 and Q1.3. By inference, this area of disagreement could indicate a difference of judgement that could influence the way participants approach the identification, evaluation and communication of findings noted during an audit.

According to literature, when auditee's perceive activities related to audit outcomes to be value adding, two outcomes are possible:

- Auditee reputation is enhanced.
- And management support for the audit process increases.

Therefore items such as audit reports; and audit findings that are significant and value-adding would fall into this category.

In addition, auditee and management satisfaction as related to the audit outcome; is a direct reflection of customer satisfaction and a key aspect of quality management. The elements captured in Table 5.7 were identified in literature as elements that impact on overall auditee/ customer satisfaction. The three areas reviewed in round 2 of the Delphi evaluation spoke directly to customer satisfaction and was captured in Table 5.7 in italics.

Table 5.7: Keys aspects influencing overall auditee/ customer satisfaction

(Source: Own source)

Reporting to Organisation	Improvement/Benefits
Report quality	<i>Resolution of audit findings</i>
<i>Management's attitude towards audit findings</i>	Efficient effectiveness review
<i>Value-adding report content</i>	
Overall client satisfaction	
Reporting time	

➤ **Respondent feedback**

From the feedback received from the respondents during the Delphi evaluation, the following relevant points were noted:

- Client satisfaction was noted by only two respondents (by meeting planned objectives and being value-adding to management).
- Report content was considered to influence audit outcomes to a lesser extent.
- One participant mentioned the audit team wasting time during audit execution in trying to resolve audit findings, i.e. reaching consensus about descriptions and ratings.
- The resolution of audit findings was not considered as part of the audit process by one respondent but rather an indication of program effectiveness.

The specific respondent feedback noted as part of the Delphi evaluation was captured in Table 5.8.

Table 5.8: Respondent feedback to Delphi evaluation

(Source: Own source)

Round 1	Feedback comment
Question 1	<p>It goes to show that the planning phase of the audit is very important even when it comes to selecting your team members.</p> <p>I agree with peaks noted in round 1 and am therefore in agreement with elements identified by other auditors.</p> <p>The audit effectiveness relates to the extent to which the objectives of the audit are met and the extent to which the audit client is satisfied with the results of the audit. Furthermore to test the audit effectiveness one should address the issue of compliance to planned arrangements and also the issue of the effectiveness of the quality system.</p> <p>Start with the "end in mind: kind of approach and consider discussing findings/ report rating during audit preparations</p> <p>Planning of the audit in terms of a well-defined scope that is based on high risk areas (would add value to management), support the effectiveness of an audit.</p>
Round 2	Feedback Comment
Q1.1- Significant audit findings can affect audit effectiveness	This depends on how the auditee accepts the findings.
Q1.2- Value-adding report content can affect audit effectiveness	<p>Only if the report content is assessed and used by the auditee.</p> <p>Remember the report has got nothing to do with corrective actions assigned to findings.</p>
Q1.3- Effective resolution of audit findings can affect audit effectiveness	<p>If the team is not clear and confident, disagreement can steal time</p> <p>I think not really because, the resolution of audit findings happens after the audit process. Normally it takes longer to resolve and the audit is long forgotten at that time. Effective resolution of audit findings is more likely to be picked up during an effectiveness review a couple of months after the audit was done. So I think effective resolution of audit findings would more likely affect the effectiveness of the audit program.</p>

5.6.4. Related meanings

In determining the elements which affect the effectiveness of the QMS audit process, the following key learning was noted. Since respondents were not in agreement about the elements reviewed during the second round of evaluation, it is possible that differences in perceptions exist. These perceptions noted are possibly related to how participants perceive the boundary of the audit process. In the Figure 5.10, the researcher has attempted to depict where the perceived boundaries were noted.

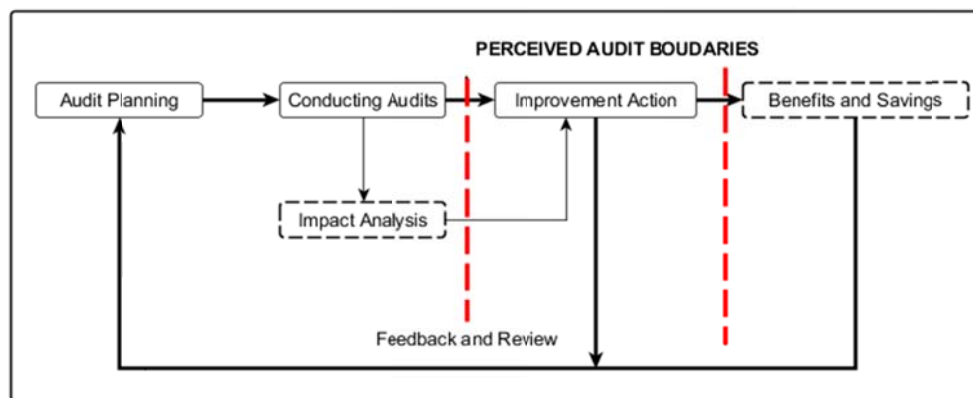


Figure 5.10: High level audit process map with perceived boundary
(Source: Elliot, Dawson & Edwards, 2007:562:Online)

From the responses received, it was evident that the perceived boundaries of the audit process noted in Figure 5.10 were different amongst the participants. These differences were observed in the first round of the Delphi evaluation and later confirmed in the second round of evaluation. The differences in perception amongst respondents could influence the audit outcome. All the statements regarding the impact on audit effectiveness has been supported by literature:

- When audit findings are raised that are perceived not to be significant and value-adding, the competency of auditors are called into question by auditees (Elliot, Dawson & Edwards, 2007:555:Online).
- When findings which are identified during an audit recur, the value of the overall audit process, which includes the identification of

corrective actions, becomes questionable (Elliot, Dawson & Edwards, 2007:Online).

- When auditors do not provide audit report content which is considered value-adding, auditors are challenged to fulfil their advisory role to management (Robitaille, 2014:7&53).

Consequently, when perceptions differ at a fundamental process level, variation in practices amongst participants could occur. Practices which could impact the effectiveness of the audit process, which may include:

- The type of audit findings raised.
- The due diligence exercised in resolving significant audit findings.
- And the provision of quality report content and quality advice.

When approaches and practices differ amongst participants in relation to these items mentioned above, variation may also occur which could impact on the way audit findings are evaluated, rated and reported.

Finally, when the impact of these practices on management's perception of the audit process is not considered, the overall audit effectiveness may be negatively impacted as well.

Although respondents consistently acknowledged aspects of the planning phase as impacting audit effectiveness, not all aspects related to: audit execution; reporting to the organisation; and auditee feedback, were consistently deemed to impact the effectiveness of the audit process. In particular, the resolution of audit findings and the overall auditee perception/auditee satisfaction was considered to a lesser degree, which may have a larger and more serious impact than that considered by the participants.

5.7. HOW CAN THE LEVEL OF OBJECTIVITY EXERCISED BY AN AUDITOR BE IMPROVED WHEN RATING AUDIT FINDINGS?

The methodology depicted in Figure 5.11 was used in answering the noted research question,

“How can the level of objectivity exercised by an auditor be improved when rating audit findings?”

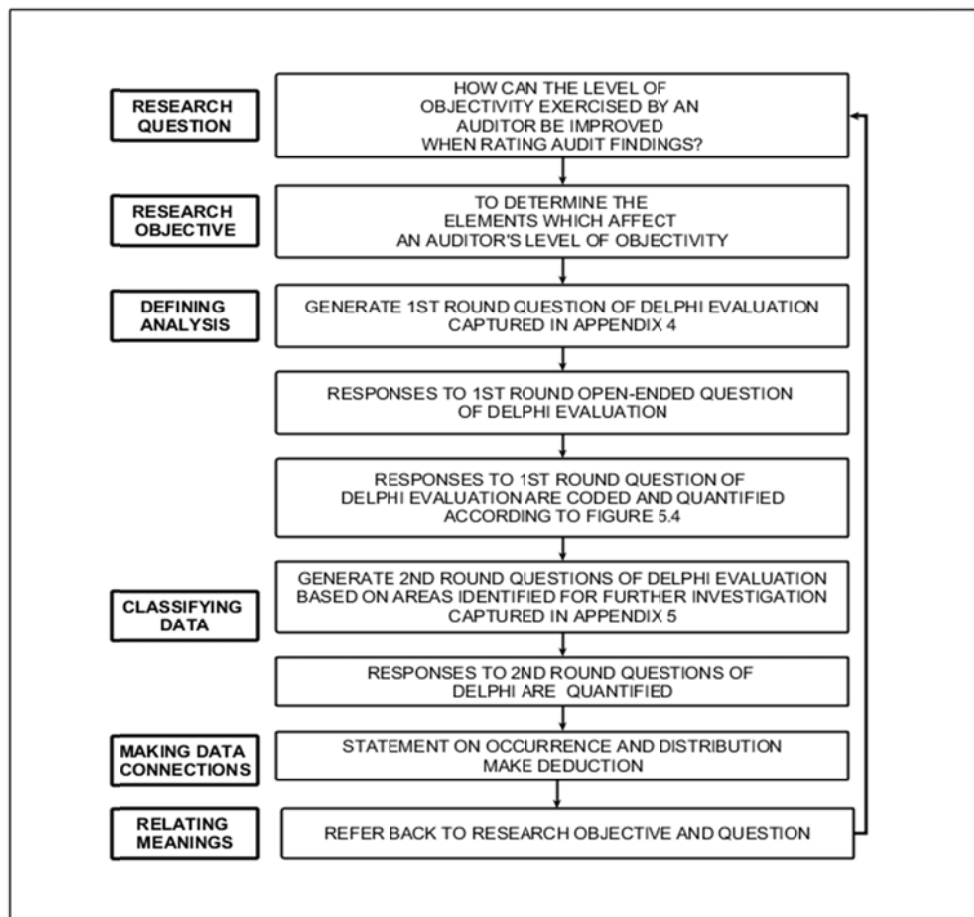


Figure 5.11: Research framework adopted for research question 2

(Source: Own source)

5.7.1. Defining analysis

Once again, the Delphi evaluation was implemented in answering this research question using the steps detailed in Figure 5.11.

5.7.2. Classifying data: Data collection; Analysis and interpretation

5.7.2.1 First round of the Delphi evaluation

➤ Data collection

Response to the following question formed the primary source of data for this research objective,

“What elements affect the objectivity of an auditor?”

➤ Analysis and interpretation

Once the responses were collected, Figure 5.4 was used as the basis for tagging. Once tagged, the categories were totalled for the quantitative representation noted in Table 5.9 and Figure 5.12.

Table 5.9: Data collected during round 1 of the Delphi evaluation

(Source: Own source)

Categories	Frequency	% Occurrence
Planning	3	60.00
Auditor qualification and experience	4	80.00
Perceived auditor competence and knowledge	3	60.00
Auditor objectivity	3	60.00
Auditor independence	1	20.00
Audit team dynamics	1	20.00

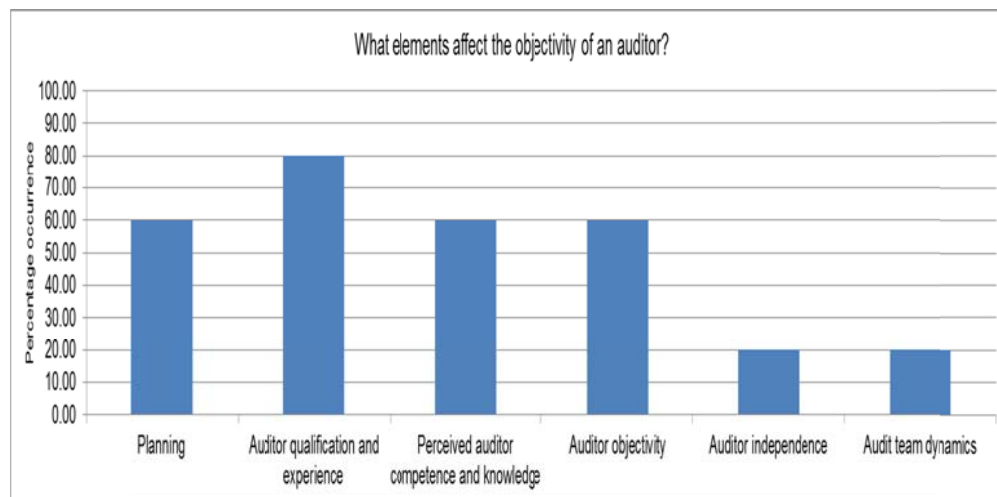


Figure 5.12: Round 1 – Question 2

(Source: Own source)

As part of the evaluation, the following salient points were noted:

- Based on the literature reviewed related to the topic of auditor objectivity, the category of “Planning” was not deemed as critical in achieving auditor objectivity. It is acknowledged that in general planning is imperative for effective audit execution; however as part of this objective, the researcher has deemed it appropriate not to evaluate this area further.
- The category of “Audit team dynamics” scored 20%. Therefore the researcher deemed it necessary to further review this area based on the following: In Section 5.6, a related category, audit team composition was noted as a matter of interest. In addition, according to Robitaille (2014:43&49) team dynamics may be critical in remaining objective and supports the practice where auditors elicit the assistance from auditing colleagues when analysing nonconformities. It was deemed important to determine how the rest of the participants perceived this factor, which could potentially influence auditor objectivity.
- As part of the literature reviewed related to an auditor’s level of objectivity, strong correlations were made to an auditor’s mind-set and existing biases. It was noted in literature that being aware of these particular mind-sets and heuristic biases may assist an auditor in countering the negative effects of bias and thereby maintaining objectivity. A total of 60% of respondents referred to auditor objectivity and therefore it was decided to further evaluate this area.
- Similarly “Auditor independence”, which is related to an auditor’s mind-set and organisational position, was one of the lowest scoring categories. According to literature, auditor objectivity and auditor independence are interdependent and for this reason the researcher decided to evaluate this area further (Karapetrovic & Willborn, 2000:680:Online).
- The categories related to “Auditor qualification and experience” and “Perceived competence and knowledge” scored 80% and 60%, respectively. Reviewing the literature as part of auditor competency, the only link made to objectivity identified by the researcher is the link

to an ethical element noted by Cheetham and Chivers (1998:267:Online). For now, this area will not be further evaluated but will be reconsidered as part of another research objective.

5.7.2.2 Second round of the Delphi evaluation

➤ Data collection

Based on the analysis of the data collected during the first phase, it was deemed logical to collect specific data related to the following areas, using the following related statements:

- Audit team dynamics can affect auditor objectivity.
- Individual auditor bias can affect auditor objectivity.
- QA's organisational position can affect auditor objectivity.

The quantified responses for this evaluation were captured in Table 5.10. In addition, data associated with the responses have been graphically represented in Figure 5.13, Figure 5.14 and Figure 5.15.

Table 5.10: Data collected during round 2 of the Delphi evaluation

(Source: Own source)

Q2.1	Audit team dynamics can affect auditor objectivity	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2	1				
	Participant 3			1		
	Participant 4		1			
	Participant 5		1			
	Participant 6		1			
	Total	1	4	1	0	0
	Percentage occurrence	17	67	17	0	0
Q2.2	Individual auditor bias can affect auditor objectivity	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2	1				
	Participant 3		1			
	Participant 4	1				
	Participant 5	1				
	Participant 6		1			
	Total	3	3	0	0	0
	Percentage occurrence	50	50	0	0	0
Q2.3	QA's organisational position can affect auditor objectivity	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2	1				
	Participant 3		1			
	Participant 4		1			
	Participant 5	1				
	Participant 6		1			
	Total	2	4	0	0	0
	Percentage occurrence	33	67	0	0	0

➤ **Analysis and interpretation**

In response to this statement related to audit team dynamics, 84% of respondents confirmed that audit team dynamics may affect auditor objectivity. While 17% of the respondents were undecided in this area.

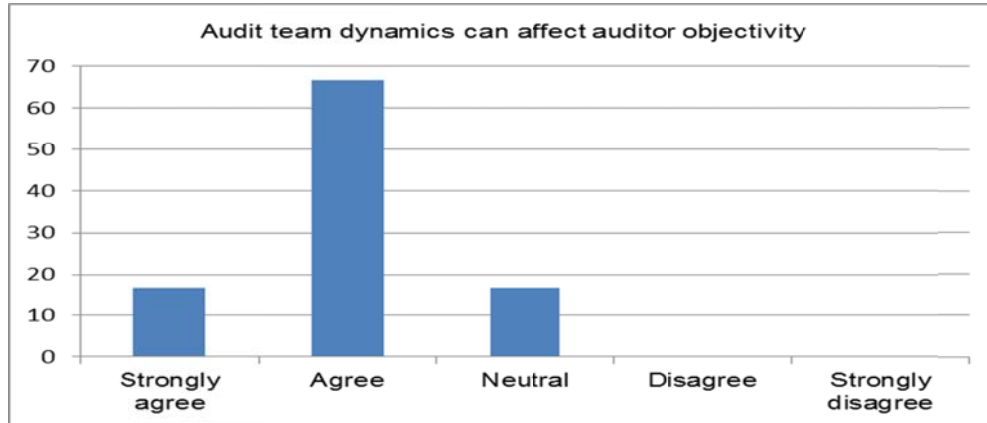


Figure 5.13: Round 2- Q2.1
(Source: Own source)

In response to the statement related to auditor bias, the respondents unanimously responded with an affirmative in this area. The split between “strongly agree” and “agree” was 50% respectively.

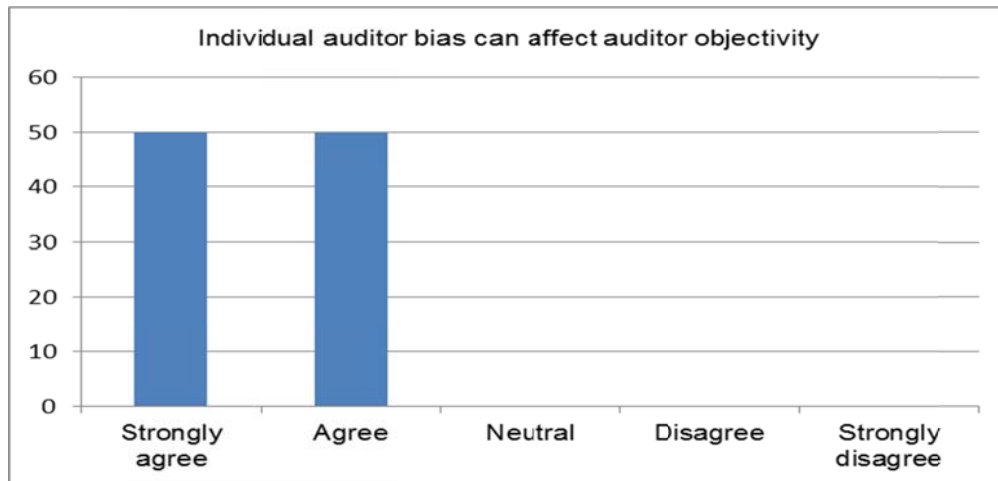


Figure 5.14: Round 2- Q2.2
(Source: Own source)

In response to the statement related to organisational position, the respondents also responded unanimously with an affirmative in this area.

The split between “strongly agree” and “agree” was 33% and 67% respectively.

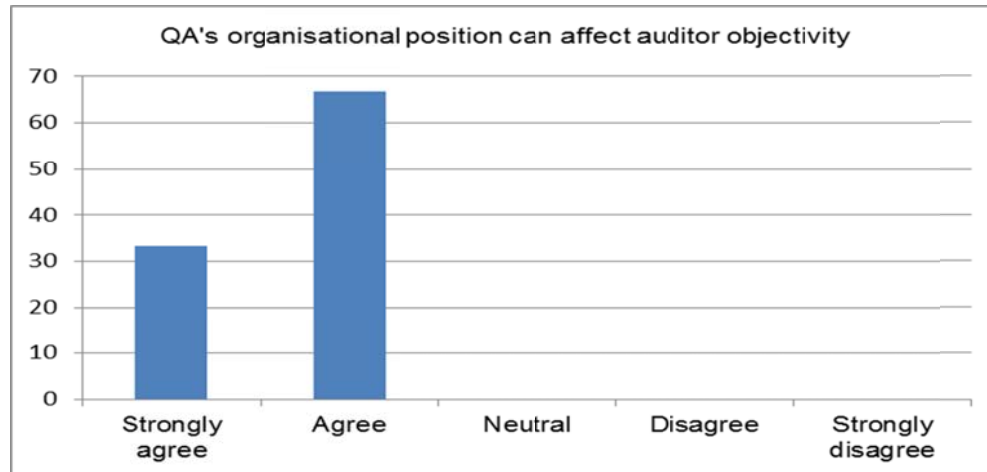


Figure 5.14: Round 2- Q2.3

(Source: Own source)

5.7.3. Data connections: Researcher's perspective; Respondent feedback

➤ Researcher's perspective

With regards to elements that affect the level of objectivity of an auditor, a strong consensus was observed in the following areas: once again “Planning”; as well as “Auditor qualification, experience, knowledge and competence” were noted as elements that could affect auditor objectivity. This result was unexpected as the literature reviewed provided limited indication that planning and auditor qualification, experience and competence would impact auditor objectivity.

It was observed that a smaller proportion of respondents acknowledged “Auditor independence” and “Audit team dynamics” in the first round of the evaluation. However consensus was noted during the second round of evaluation when 100% of the respondents agreed that organisational position and individual auditor bias could impact the levels of objectivity.

Furthermore, the low response in the area of team dynamics was unanticipated. Initially the low percentage assigned to “Audit team dynamics” was surprising as the researcher expected respondents to

acknowledge the value of audit team members in achieving and enhancing objectivity. The researcher expected respondents to acknowledge the value of relying on the background and perceived competence of fellow team members. Further evaluation during the second round provided the expected support for the category of “Team dynamics” impacting objectivity.

The researcher acknowledges that the initial higher percentage occurrence noted for “Auditor qualification and experience” and “Perceived competence and knowledge” in round 1 may have been indicative of the influence individual auditors have on team dynamics. The neutral response by 17% of the respondents in relation to team dynamics was however unexpected.

During the first round of evaluation, it was noted that no mention was made by any of the respondents of applied methodologies, used as part of decision-making processes and countering bias. This omission related to applied methodologies will be revisited in the subsequent research questions.

➤ **Respondent feedback**

From the feedback received from the respondents during the Delphi evaluation, the following relevant points were noted:

- Respondent feedback during both the first and second round of evaluation highlighted the negative impact of poor team dynamics rather than highlighting the positive impact team dynamics could have on auditor objectivity.
- Individuals continued to support the significance of auditor experience to promote auditor objectivity.
- One response indicated that organisational position was irrelevant to objectivity.
- Finally, no mention of applied auditing methods to enhance auditor objectivity was noted.

The specific feedback comments were recorded in Table 5.11.

Table 5.11: Respondent feedback related to Delphi evaluation

(Source: Own source)

Round 1	Comment
Question 2	Do more audits to gain experience to become more experienced at being objective. Agree with top 2 peaks but would rate " team dynamics" higher. Results reflective of lack of working together for a common good rating or value adding rating. Auditor competence (knowledge, experience, qualification and skills) and auditor independence determines the objectivity of an auditor.
Round 2	Comment
Q2.1- Audit team dynamics can affect auditor objectivity	The team dynamics can affect the effectiveness of an audit in that people might not all be pulling the same weight, but the objectivity of the auditor shouldn't be affected. A divided team is a losing team. People efficiency is always about and affected by how much you care not how much you know.
Q2.2- Individual auditor bias can affect auditor objectivity	Depends on auditor's power in the team Individual auditor bias might affect auditor objectivity.
Q2.3- QA's organisational position can affect auditor objectivity	People's production is the reflection of how much they are valued or alternatively how much they are under-valued and proving the point. QA's organisational position shouldn't affect auditor objectivity.

5.7.4. Related meanings

In determining the elements that affect auditor objectivity, the following salient points were noted.

Robitaille (2014:43&49) and Beckmerhagen *et al.* (2004:17-18:Online), recommended the use of peer-checking as a means of moderation and improving audit effectiveness and auditor objectivity. Even though a strong consensus was observed where most respondents acknowledged that audit team dynamics could affect auditor objectivity, the feedback received was biased towards the negative impact of audit team dynamics

on auditor objectivity rather than the positive impact moderation could effect.

As part of the moderation process it is important to note that nobody is immune to the effect of pre-conceptions. And depending on an individual's risk appetite and tolerance level to risk, auditor objectivity could be affected. In the second round of the Delphi evaluation, the impact of organisational position on auditor objectivity was evaluated. But since organisational position is difficult to alter and heuristic biases are possibly unavoidable, the previously mentioned audit team moderation could only mitigate biases to a certain extent, as individuals are able to skew decisions related to risk identification and risk analysis. In the current research environment this could translate directly to the way auditors identify and rate audit findings.

Furthermore, it was observed that respondents did not identify "Auditing methods" as an element that could impact auditor objectivity. Adding this critical omission to the effect of negative audit team dynamics, could collectively impact the level of objectivity exercised by an auditor and audit team. This is clarified in literature as follows, in order to achieve objectivity; bias needs to be mitigated and consistent methodologies need to be implemented. Therefore the adoption of an auditing method which includes a rating methodology, could counter the inherent bias in auditors and may potentially influence auditor objectivity in a positive manner (Karapetrovic & Willborn, 2001:369:**Online**). This area will be revisited in the fourth research question.

When elements that impact auditor objectivity as identified in literature are omitted and/or ignored, it is feasible to deduce that the level of objectivity exercised by auditors and audit teams could be negatively impacted. The elements noted in literature included: the identification and mitigation of known bias, using systematic type thinking when identifying and evaluating risks; and applying methodologies consistently as part of decision making processes. It is the researcher's opinion, based on the research observations that there is an over-reliance on individual

capabilities and not enough emphasis placed on consistent decision making processes.

5.8. ARE SPECIFIC RISKS CONSISTENTLY IDENTIFIED AND CONSIDERED WHEN FORMULATING THE AUDIT FINDINGS?

The research objective aimed to determine whether specific risks were consistently identified and considered when formulating the audit findings. In order to meet this objective, the research question required evaluation according to the outline in Figure 5.16.

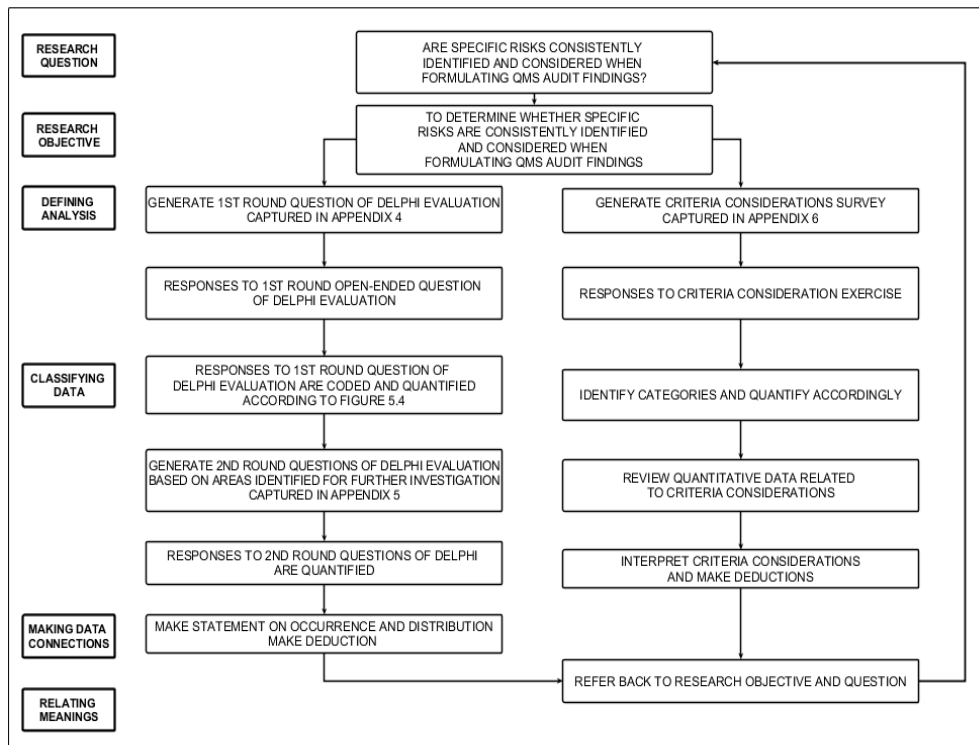


Figure 5.16: Research framework adopted for research question 3

(Source: Own source)

5.8.1. Defining analysis

Apart from the Delphi evaluation, which will be used to evaluate the opinions related the purpose of rating audit findings; a second survey will be performed. The purpose of the second survey was to determine the criteria applied during the formulation of a high; medium; and low rated findings.

During the second survey, the description of findings that could influence the response of the participants was not provided. Furthermore the use of the word “rating” versus “formulating” was specifically used for the following reason:

- In the opinion of the researcher, the *formulation* of a finding signified a process where certain inputs culminated in a conclusive finding. However based on the documented process used by the population being surveyed, audit findings were discussed, formulated and rated in one step (Eskom 2012:13).

Therefore at this stage of the research study, the formulation and rating of a finding could be considered as one indistinguishable step.

5.8.2. Classifying data: Data collection; Analysis and interpretation

5.8.2.1 First round of the Delphi evaluation

➤ Data collection

The primary source of data was collected in response to the following question,

“Why do QA auditors rate/grade audit findings?”

➤ Analysis and interpretation

The individual responses were tagged according to Figure 5.4. The frequency of occurrence was captured in Table 5.12 and graphically represented in Figure 5.17.

Table 5.12: Data collected during round 1 of the Delphi evaluation

(Source: Own source)

Categories	Frequency	% Occurrence
Identify potential risks to operational and business processes	5	100
Highlight significant audit findings	5	100

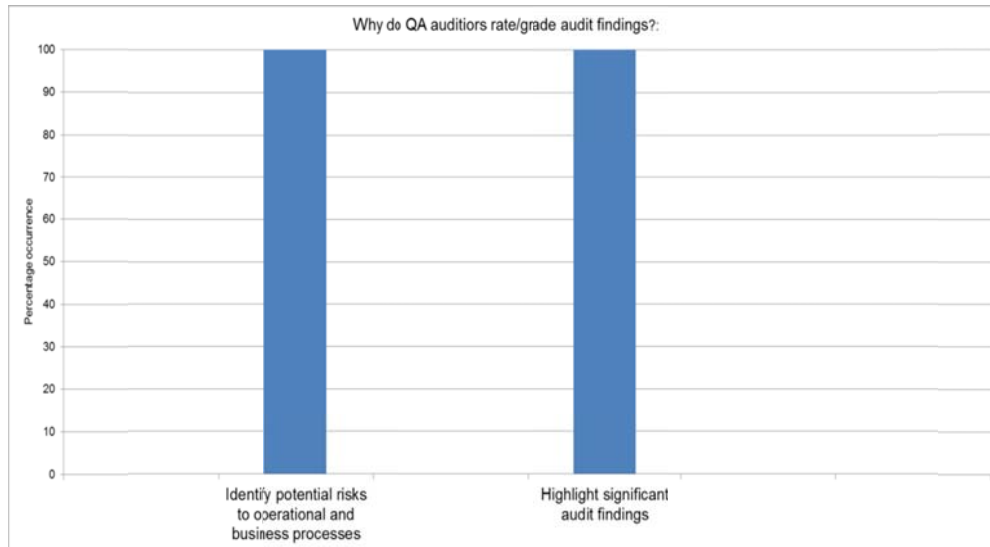


Figure 5.17: Round 1 – Question 3

(Source: Own source)

Similarly to the previous sections, the Delphi evaluation was executed with the purpose of determining the opinions of the participants. In this section, the purpose of rating audit findings was deemed as meaningful. Reviewing the results, it was observed that all participants considered the purpose of rating audit findings as follows:

- Identify potential risks to operational and business processes.
- Highlight significant audit findings.

It is curious to note that “significant” in light of audit findings usually denotes a finding which is able to identify risk (Beckmerhagen *et al.*,2004:18:**Online**). In addition significant audit findings could also refer to qualities that include: valid and reliable audit findings and denotes a finding of good standard as perceived by the auditee.

From the initial evaluation, it was observed that all participants possessed similar opinions. However, based on literature highlighting the importance of auditee perception, the researcher elected to review how the respondents perceived the following in particular:

- Auditees understanding of the rating system of audit findings.
- As well as the auditee’s attitude toward the rating system of audit findings.

5.8.2.2 Second round of the Delphi evaluation

➤ Data collection

Based on the afore-mentioned rationale, the data collected during this phase of the Delphi evaluation was based on the following statements:

- The reason for rating audit findings is not well understood by auditees.
- Rating audit findings is for QA use only.
- Rating audit findings is an indication of risk.

The responses noted to this stage of the evaluation were captured in Table 5.13.

Table 5.13: Data collected during round 2 of the Delphi evaluation

(Source: Own source)

Q3.1	The reason for rating audit findings is not well understood by auditees	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2		1			
	Participant 3	1				
	Participant 4		1			
	Participant 5	1				
	Participant 6		1			
	Total	2	4	0	0	0
	Percentage occurrence	33	67	0	0	0
Q3.2	Rating audit findings is for QA use only	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1				1	
	Participant 2				1	
	Participant 3				1	
	Participant 4				1	
	Participant 5			1		
	Participant 6			1		
	Total	0	0	2	4	0
	Percentage occurrence	0	0	33	67	0
Q3.3	Rating audit findings is an indication of risk	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2	1				
	Participant 3	1				
	Participant 4	1				
	Participant 5			1		
	Participant 6				1	
	Total	3	1	1	1	0
	Percentage occurrence	50	16.7	16.7	16.7	0

➤ **Data analysis and interpretation**

As part of this section, the researcher evaluated the distribution of the responses noted in Table 5.13 and represented this information graphically in Figure 5.18; Figure 5.19; and Figure 5.20 respectively.

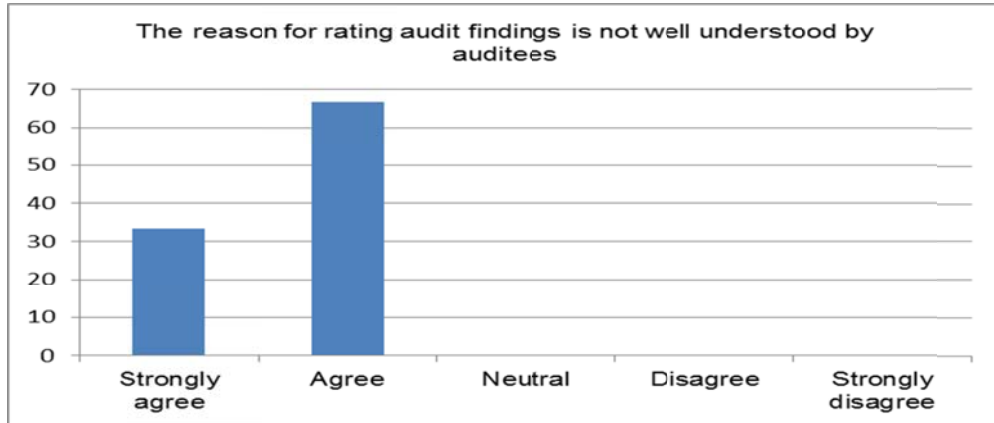


Figure 5.18: Round 2- Q3.1

(Source: Own source)

According to the responses received, 100% of the respondents agreed that the auditees did not understand the purpose of QA rating audit findings.

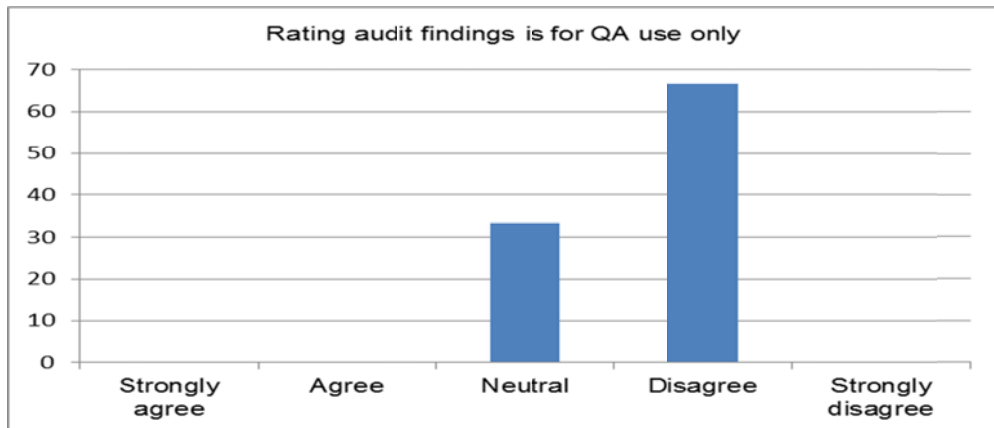


Figure 5.19: Round 2- Q3.2

(Source: Own source)

Conversely, the majority of the respondents perceived the rating of audit findings to be for the auditee's benefit as well and not only for QA's purpose. A marginal amount of respondents remained neutral in this regard.

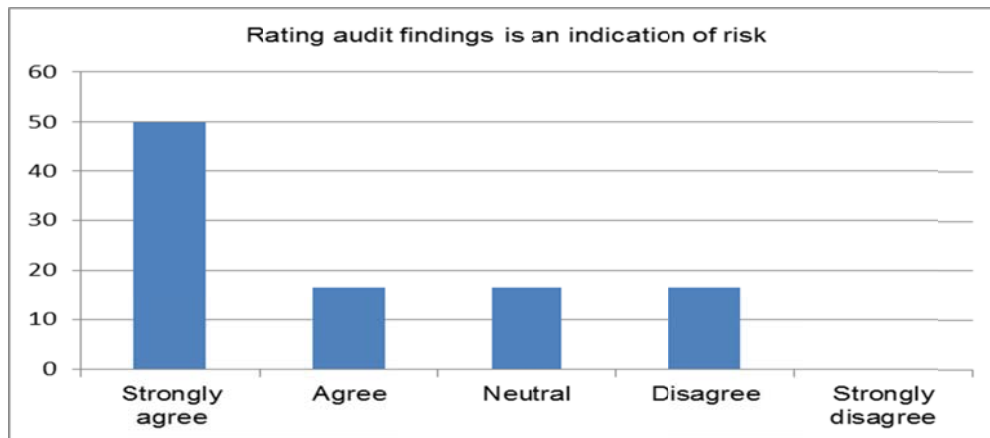


Figure 5.20: Round 2- Q3.3

(Source: Own source)

Of the observed responses, 66.7% of the respondents considered the rating of a finding to be an indication of risk. A lower proportion of the respondents either disagreed or remained undecided, a noted 16.7% respectively.

5.8.2.3 Criteria considerations when rating/formulating audit findings

➤ Data collection

The responses related to the open-ended question noted below have been captured in Table 5.14,

“Which criteria/considerations would you use when rating the following types of findings: High, Medium and Low?”

A total of eleven surveys were distributed to the participants. Seven responses were received, indicating a 63% response rate.

Table 5.14: Specific responses captured for the second survey

(Source: Own source)

	High	Medium	Low
Response 1	*License non-compliance *Process breakdowns	*Serious consequence *The nonconformity may indicate that a key aspect of the process is being neglected.	*Admin issues
Response 2	*Licence requirements *Impact on QMS *Impact on the plant *Impact on the process	*Impact on licence implementation *Impact on QMS structure *Impact on process input	*Impact on support processes *Interface control * QMS issues *Admin issues
Response 3	*Licensing Document violation *Non -fulfilment of KSA, KAA requirements	*Left to auditor perception	*Inadequate administrative controls
Response 4	*Regulatory non-conformance *Breakdown of process important to safety *Breakdown or risk to process important to availability	*Process deficiency with lesser impact	*Administrative issues *Low impact nonconformity
Response 5	*Licence non-compliance *Non-compliance noted in LD	*Record anomaly related to licence requirement	*Administrative nonconformity *Low significant nonconformities
Response 6	*Licence nonconformity *Process breakdown	*A number of as founds in a process/procedure *Indications of risk to barriers and/or plant	*A number of as founds in a process/procedure *Indications of risk
Response 7	*Impact on safety and reliability of the plant	*No comment	*No impact on plant *Non-compliance to a requirement

➤ **Analysis and interpretation**

The responses noted in Table 5.14 were examined in order to identify pertinent terms or key phrases. Once these pertinent words/terms were identified, these items were then tagged and then grouped accordingly, quantified and represented graphically in the following section.

Words identified as labels/tags and used to develop categories were noted below:

- Regulatory/Legal/Statutory.
- Process.
- Production and Plant Reliability.
- Plant/Nuclear Safety.
- QMS/Administrative/Interface

These categories were previously identified as the areas of interest for the various stakeholders in the research environment. Once categorised, the

frequency of occurrence of these key words/terms were quantified and represented graphically in Figure 5.21.

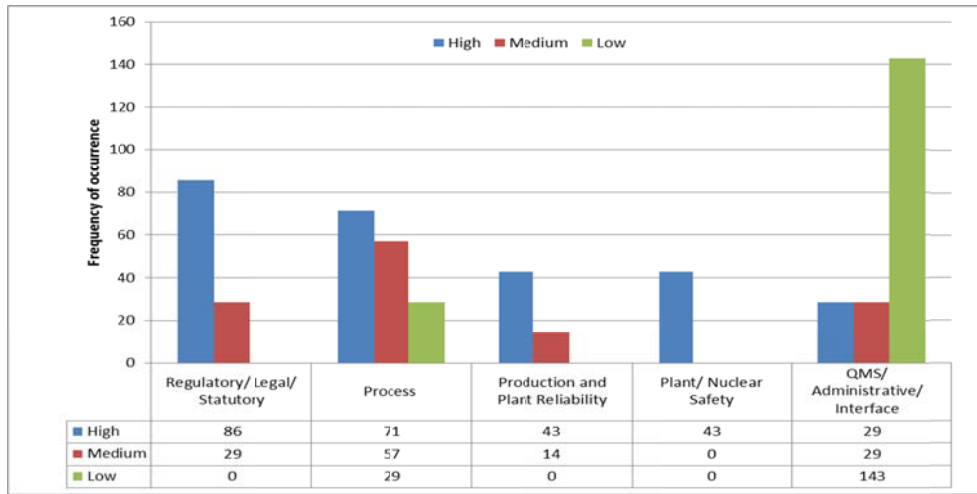


Figure 5.21: Initial classification of data collected

(Source: Own source)

Referring to Figure 5.21, a particularly high frequency of the last category, “QMS/Administrative/Interface” was noted. In order to eliminate ambiguity and provide further clarity, it was decided to separate this category into the smaller identified components in order to provide additional insight to the data collected in this area. The result of this dissection was captured in Figure 5.22.

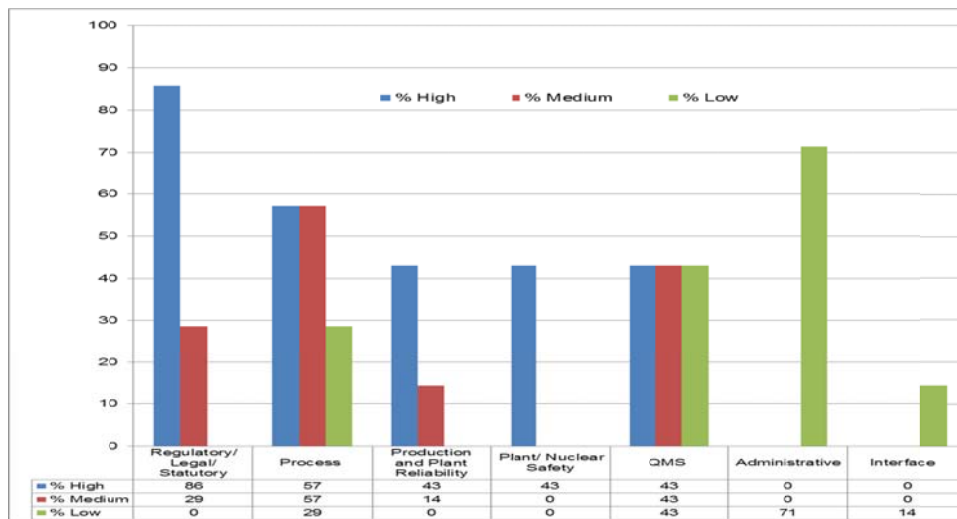


Figure 5.22: Secondary classification of data collected

(Source: Own source)

As reflected in Figure 5.22, the dissection of the “QMS/Administrative/Interface” category provided improved resolution and enhanced insight regarding this category. The tag “Administrative” was by far the most extensively used term used by the auditors when formulating findings in this area.

When it comes to the consistent application of criteria when formulating findings of different grading, the following was observed:

- **High:** The majority of the responses perceived Regulatory/Legal/Statutory anomalies and Process breakdown anomalies when rating this type of finding.
- **Medium:** The majority of the responses perceived Process breakdown anomalies to fall within this category.
- **Low:** The majority of the responses perceived QMS and Administrative anomalies in this area.

The criteria employed to measure a “medium’ rated audit finding revealed the greatest variance amongst the auditors. This is depicted by the generally lower percentage values depicted in Figure 5.21.

In addition to the words previously identified as tags/grouping, the researcher also elected to evaluate whether auditors identified elements that may potentially indicate the consideration of consequence of the identified finding. As previously noted, consequence of a finding would typically inform the rating of a finding and so it seemed prudent to evaluate this element objectively. For this purpose, the following words/terms were identified (Smith, Bester & Moll, 2014:80):

- Consequence.
- Significance.
- Impact.
- Risk.

The data related to each term noted above was captured in Figure 5.23.

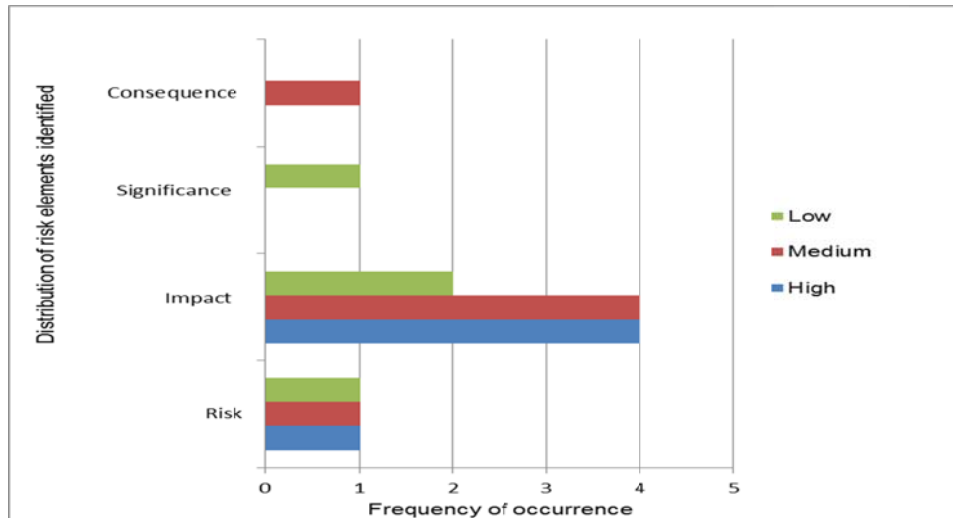


Figure 5.23: Distribution of terms noted associated with risk/consequence
(Source: Own source)

Each participant's response was evaluated per grading of finding. The cumulative score per respondent was noted in Figure 5.24. In addition, the result for each respondent, depicting each term and the relation to the specific finding category, was recorded in Appendix 11.

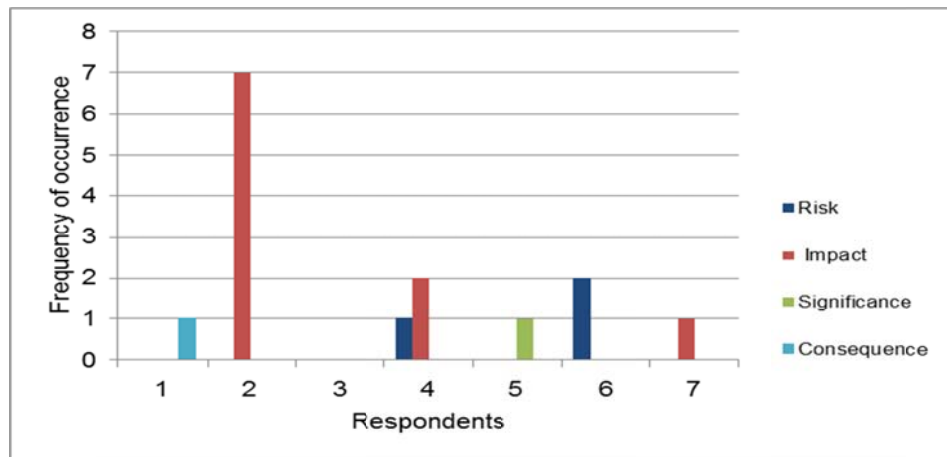


Figure 5.24: Cumulative risk considerations per respondent
(Source: Own source)

Even though it is acknowledged that the element of risk and consequence may have been considered by all auditors as part of the formulation and rating process, the researcher felt it important to highlight instances where this consideration was explicitly noted by the individual auditors.

5.8.3. Data connections: Researcher's perspective; Respondent feedback

➤ Researcher's perspective

As part of the Delphi evaluation, all participants identified the purpose of rating audit findings to include: identifying risk and raise significant audit findings, which are both related to risk identification and risk management. To support this opinion, the second round of evaluation confirmed that the majority of participants considered risk identification to be the purpose of rating findings. This opinion however was not unanimous, which was an unexpected result.

Further evaluation revealed that the majority of participants perceived the rating process not just for QA's use. By inference, rating should therefore be used by the auditee and be of value to the auditee in some manner. However the responses also noted that the current rating system was not well understood by the auditee, making it difficult to solicit auditee support for ratings of findings if they don't understand the purpose of the rating.

Comparing the results from the Delphi evaluation and the exercise that evaluated the criteria considerations, the following were noted: It can be inferred that participants may have considered risk and consequence to varying degrees when formulating/rating a finding. In addition, based on the absence of key phrases such as consequence; significance; impact and risk in the responses noted by the participants during the criteria exercise (see Figure 5.23), the degree to which risk is considered cannot be confirmed.

Refining the guidelines/criteria to determine a medium rated finding, may need to be considered as the category and associated criteria observed the most variation. Related to reducing the variability observed in this area, the clarification of certain terms such as "process breakdown" and "administrative anomalies" which were used in describing the criteria for medium rated findings may also be required.

➤ **Respondent feedback**

From the feedback received from the respondents during the Delphi evaluation, the following relevant points were noted:

- The lack of understanding by auditees regarding the purpose of rating findings.
- Questions related to the value of rating audit findings for the auditee.
- Differences in understanding of terms amongst respondents were noted which included: Risk measurement, in general; and areas where risk is identified. The specific respondent feedback noted was captured in Table 5.15.

Table 5.15: Respondent feedback related to Delphi evaluation

(Source: Own source)

Round 1	Comment
Question 3	<p>Auditees are not open to audits and even less open to receiving findings, so the higher the rating the less they like them and therefore see findings as punitive.</p> <p>By rating audit findings, auditors assist management in identifying high risk areas, and to prioritise the actions accordingly.</p> <p>Would have hoped for better peak at "identify potential risks."</p>
Round 2	Comment
Q3.1- The reason for rating audit findings is not well understood by auditees	<p>In most cases (frequently observed), where the reason for rating audit findings is not well understood by auditees.</p> <p>Auditors also do not understand the reason for rating findings.</p>
Q3.2- Rating audit findings is for QA use only	<p>This may be the case, because the auditee does not use our ratings, they only use the objective evidence. Unless the rating is intended for other stakeholders like the NSA or NNR. If this is not the case, perhaps the ratings are for QA use only.</p> <p>Also for oversight reporting and trend visualisation for external stakeholders.</p> <p>Sometimes do not understand why findings are rated.</p>
Q3.3- Rating audit findings is an indication of risk	<p>Not certain this is the case, If for example we look at risk as the probability of something going wrong multiplied by the impact, it is not clear how rating our NCs satisfy this definition.</p> <p>Risk on what? The QMS? The process? Or Both?</p> <p>Different understandings exists related to: Finding, Process, System.</p> <p>Different views of what is Risk within QA scope of work.</p>

As part of the criteria consideration survey, generally there was agreement amongst the participants that a level of inconsistency existed, especially when grading an audit finding as medium.

“It’s mildly disturbing to see the variance and lack of clarity amongst auditors in terms of what constitutes a medium nonconformity, particularly considering the number of medium NCs that are raised”.

Further, uncertainty regarding the use of certain phrases and terms used by fellow participants were noted. Indicating a possible need of a glossary, giving clear definitions and parameters for certain terms used by the auditing organisation. The most salient points related to the respondent feedback for the second survey have been tabulated in Table 5.16.

Table 5.16: Respondent feedback for second survey

(Source: Own source)

Respondent 1	Not consistent when it comes to deciding what is a high, medium or Low graded NC. A process breakdown on the other hand can be interpreted differently by different leads. One has to understand what a ‘serious consequence’ is and what a ‘key aspect’ is. Similarly what constitutes ‘Admin issues?’ When using all the criteria listed by the responses means that different outcomes will result based on experience, and interpretation of data.
Respondent 2	License non-compliance and Admin issues generally seem to position in High and Low respectively. While Medium seems to be the biggest uncertainty. In practice Medium is the highest number of ratings. A negative perception if a single auditor rated a finding but the confidence increases sufficiently based on audit team acceptance of ratings and cold review of findings.
Respondent 3	Agree that high is pretty much well understood, however would add one element which is not explicitly included and that is statutory non-conformance on the high. Medium is clear, key aspects of the process are not adhered to but think there is still a bit of clarity required in the space even though general understanding exists.

Table 5.16: Respondent feedback for the second survey

(Source: Own source)

Respondent 4	<p>Agree with the criteria used for rating a high nonconformity, where it states process breakdown or license noncompliance. The criteria related to “impact on...QMS/plant/process” would need to be classified further in my view to explain why they are a high. It’s mildly disturbing to see the variance and lack of clarity amongst auditors in terms of what constitutes a medium nonconformity, particularly considering the number of medium NCs that are raised.</p> <p>Similarly, items of “impact on...” would need further clarification.</p> <p>Agree most with Response 1 and Response 6 in terms of what should be considered in broader terms for a medium NC. Agree with the statements indicating things such as Administrative issues/low significance for rating of a low NC.</p> <p>Disagree with statements that say a low NC should relate to “impact in support processes” as support process can have significant impact. Similarly, “a number of as founds” in a procedure would be more appropriate as a Medium NC, so disagree with that in a Low NC rating space.</p>
---------------------	--

5.8.4. Related meanings

In determining whether risks are consistently identified and considered as part of formulating an audit finding, the following significant topics were noted. Since rating an audit finding is a type of measurement, it is probable to assume, that the measurement is required to be of value. Besides value-adding, the measurement should be considered effective, valid and reliable.

According to Hubbard, (2010:21), to ensure a measurement of any sort or for any purpose is effective, the elements noted in Table 5.17 is required.

Table 5.17: Elements of an effective measurement

(Source: Hubbard, 2010:21)

Item	Element
1	Understanding the purpose of a measurement.
2	Determine for whom the measurement is intended for.
3	Depending on who the measurement is for, determine what gets measured.
4	In addition, what level of accuracy is required will be influenced by the previously mentioned items.

During the observations it was determined that a common understanding existed amongst the respondents about the purpose of rating an audit finding. However further evaluation indicated some incompatibilities. Even though respondents claimed the rating is for both QA and auditee use, the fact that auditees do not understand the purpose of rating audit findings, challenges the rating measurement to be valid, reliable and value-adding to the auditee, in terms of expectations noted by Hubbard (2010). Furthermore, if the intent of the measurement is not understood by the auditee, it can be inferred that the expectations related to actions associated with the various ratings may not be defined, understood and effectively communicated. When expectations are not understood and communicated, possible dissatisfaction by either or both parties may be experienced when these expectations are not met, resulting in the perception of ineffectiveness.

Relating all this information to the literature reviewed, according to Elliot, Dawson and Edwards (2007:555:**Online**), audit effectiveness seems to be as much dependent on auditee perception as it depends on audit execution and auditor competence and performance. Therefore the ability to influence and improve auditee perception may enhance auditor/auditee relations and add value to the organisation's performance as a whole.

Even though all respondents acknowledged that the purpose of the rating process, was for identifying significant findings and identifying operational and business process risk, inconsistencies were noted during the rating criteria survey which tested the inputs to formulating a finding. The results from this survey indicated variability amongst participants, particularly in rating a medium rated finding. Relating this back to the intent of the rating, when the intent of the measurement is not clear, knowing what to consider as part of the measurement becomes a challenge. Therefore in the researcher's opinion, a conclusion that specific risks were not consistently identified and considered when formulating the audit findings was therefore determined.

5.9. ARE SPECIFIC RISKS CONSISTENTLY IDENTIFIED AND CONSIDERED WHEN RATING AUDIT FINDINGS?

The framework noted in Figure 5.25 was used to facilitate the answering of the particular research question.

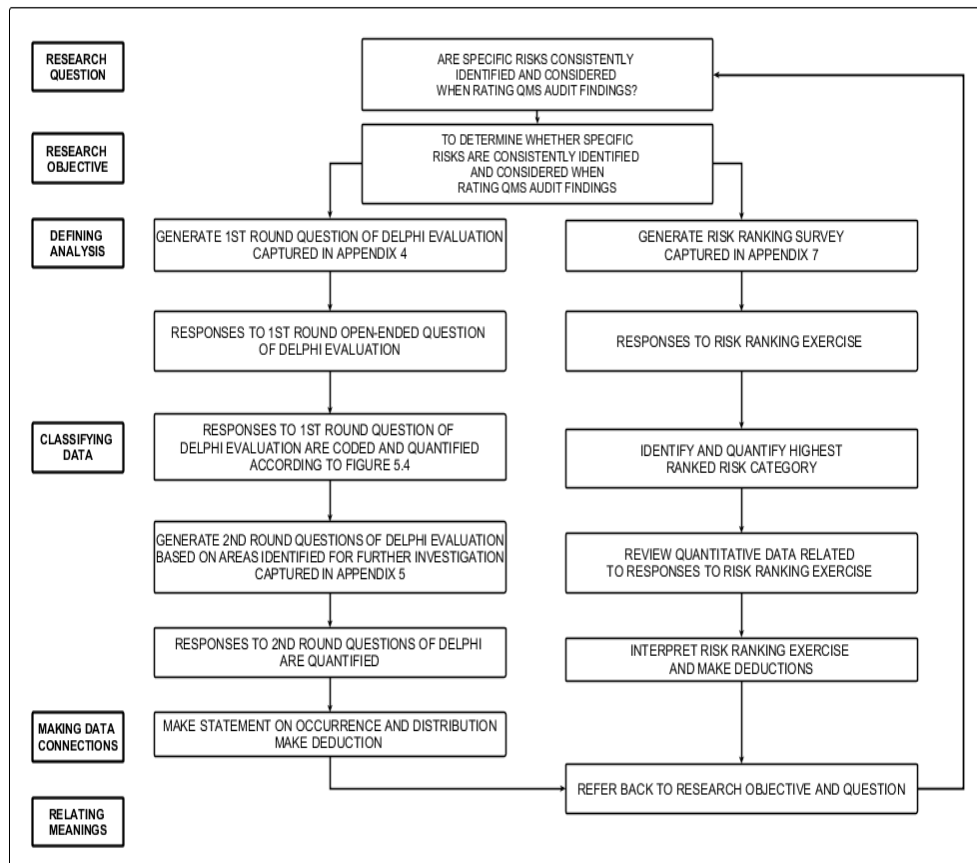


Figure 5.25: Research framework adopted for research question 4

(Source: Own source)

5.9.1. Defining analysis

The Delphi evaluation technique and a risk ranking exercise were administered in order to determine the following:

- If variability occurred amongst auditors and audit teams when formulating and rating findings, to determine the reasons for inconsistency.
- Whether risk categories were considered and ranked consistently amongst the participants.

5.9.2. Classifying data: Data collection; Analysis and interpretation

5.9.2.1 First round of the Delphi evaluation

➤ Data collection

The Delphi technique evaluated the reasons for variations amongst auditors and audit teams when rating audit findings by asking the following question,

“What elements contribute to auditor/ audit team variability?”

➤ Analysis and interpretation

The responses to the first round of evaluation were tagged, quantified and depicted in Table 5.18 and Figure 5.26.

Table 5.18: Data collected during round 1 of the Delphi evaluation

(Source: Own source)

Categories	Frequency	% Occurrence
Unable to identify potential risks to operational and business processes	1	20.00
Planning	1	20.00
Perceived auditor competence and knowledge	5	100.00
Auditor qualification and experience	1	20.00
Auditing methods	4	80.00
Biased decisions	4	80.00

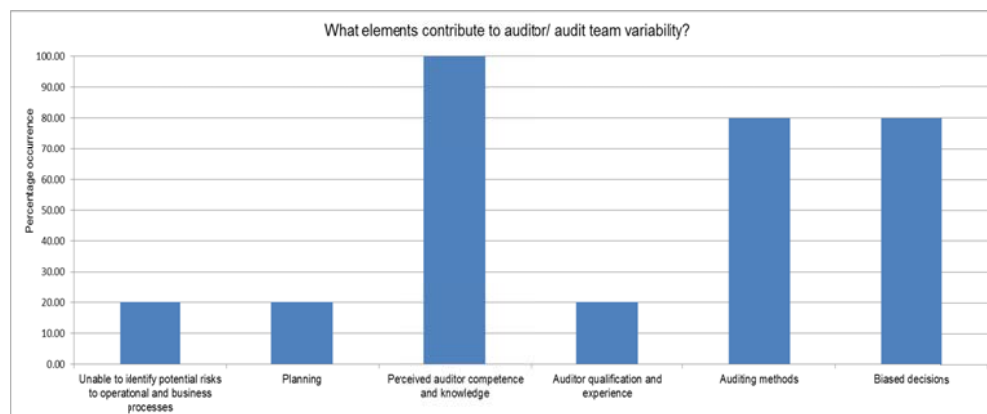


Figure 5.26: Round 1- Question 4

(Source: Own source)

The salient points noted in the first round of the evaluation were:

- The highest scoring categories, with a noted 100% score was the category of “Perceived auditor competence and knowledge”
- “Auditing methods” and “Biased decisions” was the second highest scoring categories, at 80%.
- The lowest scoring categories were, “Auditor qualification and experience”; “Planning” and “Identification of potential risk”.

Based on the literature reviewed related to: auditor objectivity; mitigating bias during decision-making processes; and using applied methodologies in risk evaluation, it was decided to follow-up on the following areas in the second round of the Delphi evaluation by reviewing opinions related to:

- The area of “Applied methodologies” adopted during risk identification and decision making will be evaluated further.
- In addition, this area was noted as requiring further evaluation during the assessment of research question discussed in Section 5.7 which is linked to “Auditing methods” and “Biased decisions”.

5.9.2.2 Second round of the Delphi evaluation

➤ Data collection

Based on the afore-mentioned rationale, the data collected during this phase of the Delphi evaluation were based on the following statements:

- Terms used in rating audit findings are not well understood.
- Rating criteria should only consider quality elements.
- Rating criteria should consider elements of safety, reliability and quality.

The responses noted for this stage of the evaluation were captured in Table 5.19 and graphically noted in Figure 5.27, Figure 5.28, and Figure 5.29.

Table 5.19: Data collected during round 2 of the Delphi evaluation

(Source: Own source)

Q4.1	Terms used in rating audit findings are not well understood	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2		1			
	Participant 3	1				
	Participant 4	1				
	Participant 5		1			
	Participant 6	1				
	Total	3	3	0	0	0
	Percentage occurrence	50	50	0	0	0
Q4.2	Rating criteria should only consider quality elements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1				1	
	Participant 2				1	
	Participant 3				1	
	Participant 4				1	
	Participant 5			1		
	Participant 6			1		
	Total	0	0	2	4	0
	Percentage occurrence	0	0	33	67	0
Q4.3	Rating criteria should consider elements of safety, reliability and quality	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2	1				
	Participant 3	1				
	Participant 4		1			
	Participant 5	1				
	Participant 6			1		
	Total	3	2	1	0	0
	Percentage occurrence	50	33	17	0	0

➤ **Analysis and interpretation**

The majority of respondents considered the terms used during the rating process, not well understood. There were no neutral responses in this regard.

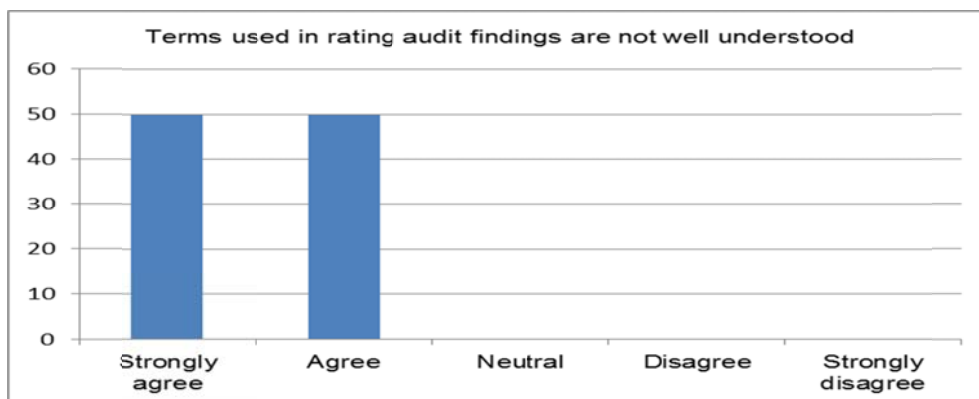


Figure 5.27: Round 2- Q4.1

(Source: Own source)

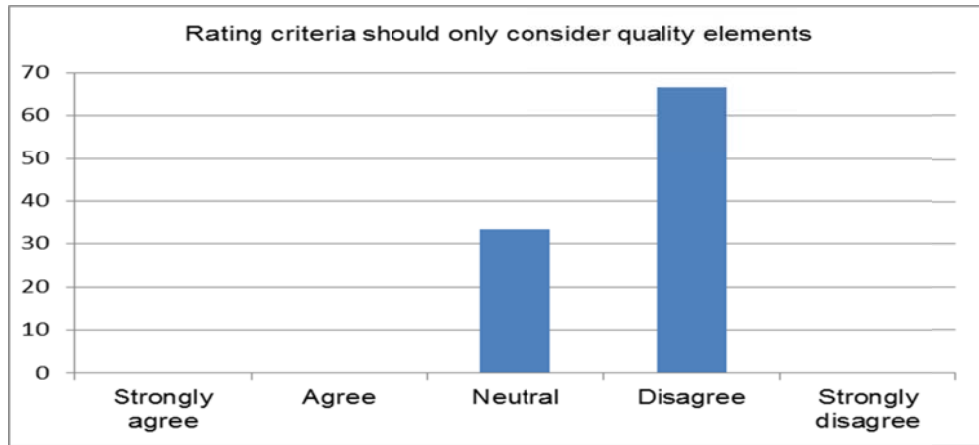


Figure 5.28: Round 2- Q4.2
 (Source: Own source)

In this area, 67% of respondents were of the opinion that the risk criteria should consider aspects other than quality. A minor proportion (33%) of the respondents remained undecided on this topic. Respondents were of the opinion that the rating criteria should consider aspects other than quality.

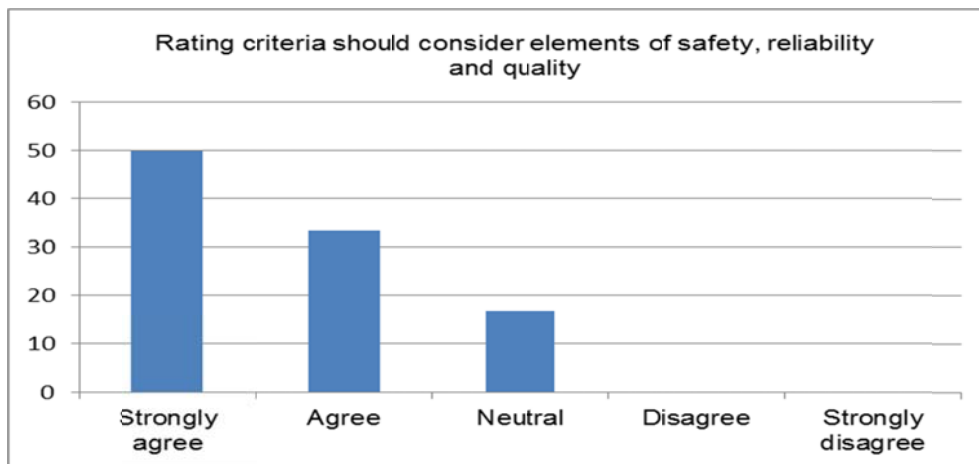


Figure 5.29: Results of Q4.3
 (Source: Own source)

The majority (83%) of the respondents supported including multiple elements into the rating criteria. A total of 17% of the responses were neutral.

5.9.2.3 Risk ranking exercise

Using a sample of audit findings, auditors were asked to perform the following actions:

- Evaluate each finding description.
- Determine the area of risk from a list provided: quality, safety, plant reliability, regulatory.
- Rank the areas of risk associated with the audit finding from highest to lowest significance using a “1” to “4” scoring. Where a score of “1” is considered the highest risk area and “4” the lowest risk area.
- Auditors were also asked to provide a brief definition of their perception of each category.

➤ **Data collection**

The auditors were only provided with the finding description, compelling the auditors to use the effect or the materiality of a finding when determining the potential consequence and risk. For this activity, eleven auditors were surveyed but only six auditors responded, representing a 54% response rate. The data collected for the risk ranking exercise was captured in Appendix 12.

➤ **Analysis and interpretation**

For the purpose of the analysis, only the risk area identified as the highest priority by each respondent, for each audit finding, would be considered. The distribution of the highest rated risk categories was graphically represented in Figure 5.30.

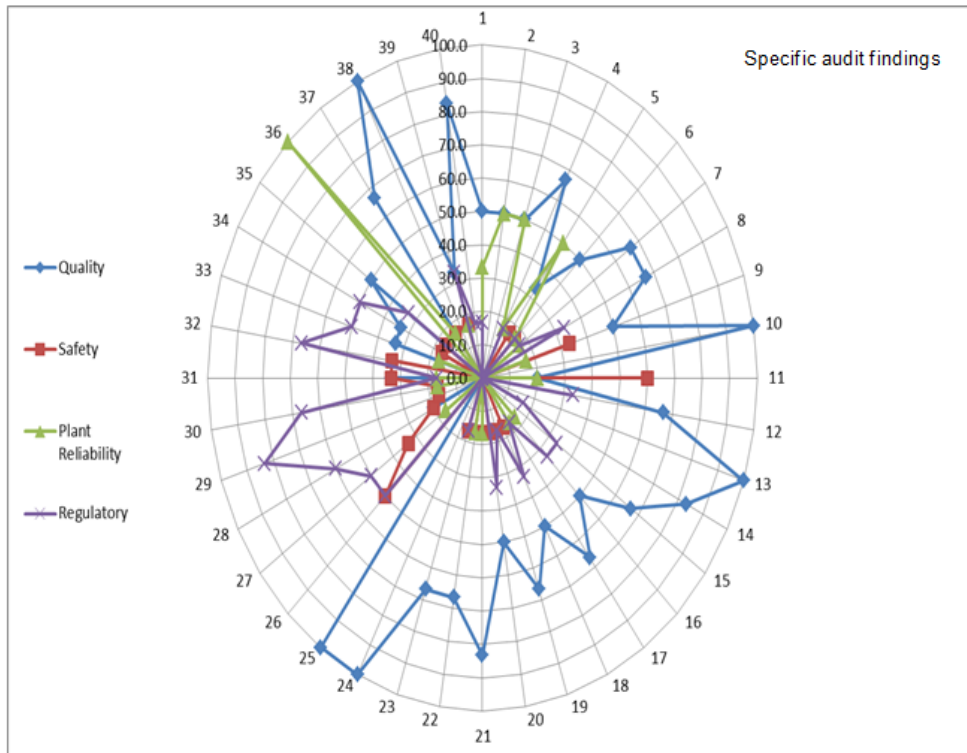


Figure 5.30: Percentage distribution of highest ranked risk area per audit finding
 (Source: Own source)

It was evident from Figure 5.30 that considerable variation existed amongst the respondents when ranking the specific risk areas. However the category of quality was consistently deemed more important than any of the other categories, but to varying degrees.

The understanding of the various risk categories amongst the respondents was also tested by means of each respondent providing an explanation of each risk category, as perceived by the individual. The results of the exercise were captured in Table 5.20.

Table 5.20: Auditor descriptions of risk categories change

(Source: Own source)

	Quality	Safety	Plant Reliability	Regulatory
Participant 1	How well are things executed, reported, fixed, delivered. Adherence to process and procedures	Conventional safety, nuclear safety, radiological safety, personnel safety	Impact on plant actions/ decisions. Impact on continuous running of plant.	NNR, legal, regulatory requirements. Adherence to government and international
Participant 2	Assurance of the process or product cannot be given.	Personnel, plant safety, nuclear safety is in question	Production is threatened	Licence is under threat
Participant 3	Nonconformity which may impact negatively on the management system performance or outputs.	Nonconformity which may impact negatively on conventional or nuclear safety.	Nonconformity which may impact negatively on the reliability of plant, systems or components.	Nonconformity to licence requirement.
Participant 4	Negatively impacts on the requirements of ISO9001. Difficult not to instinctively peg a lot of things to quality as the no 1 risk because of its "umbrella" nature and impact on all other aspects identified here.	As relates to nuclear safety. Can have a negative impact on the reactor core.	Can lead to one of the units coming down.	Legal matters whereby Eskom might be violating national or local (generation) requirements, or not able to produce a record when required.
Participant 4	Means what we do to prove that we are capable of meeting the customer's requirements.	Is about nonconformities that if not addressed could affect aspects of safety, being nuclear or conventional safety.	These are nonconformities that indicate that things we do or have done could compromise the reliability of plant's operations.	These are requirements of what the regulatory bodies expect us to comply with in order to protect the public and stakeholder interest.
Participant 6	Non compliance to QMS management processes.	In my view this is both industrial safety and nuclear safety.	Impact on the plant systems and components	Difficult to say, as this could be non compliance or regulatory requirement not cascaded into the KOU QMS. I went for impact on regulatory requirement.

As depicted in Table 5.20, the understanding of the various risk categories amongst the respondents revealed that a similar understanding for each category was shared amongst the participants.

5.9.3. Data connections: Researcher's perspective; Respondent feedback

➤ Researcher's perspective

Based on the results observed during the Delphi evaluation, respondents were in agreement that the current auditing methods used in rating findings may be contributing to the variability amongst auditors. In support of this notion, the category of, "Biased decisions" were also identified by most respondents as a contributory factor to auditor and audit team variability.

Furthermore, when the specifics in this area were assessed during the second round of the Delphi evaluation, it was found that the rating criteria may have certain shortcomings which include: The misunderstanding of terms; the consideration of multiple aspects, which could add variation to the rating process.

Even though the second round of the Delphi evaluation noted consensus amongst respondents related to the inclusion of various elements such as safety and reliability and not just quality elements, the results noted during the ranking exercise was in contradiction to this statement. The results observed during the risk ranking exercise indicated a biased towards quality related risk. This could be due to the fact that not enough information was provided to the respondents during the exercise, or due to professional preference as the respondents are quality practitioners, with a natural bias towards quality type issues.

In addition, the researcher expected the results depicted in Figure 5.28 and Figure 5.29 to be mirror images of each other as these statements were assessing the same aspect: whether only to include quality elements; or whether to include other elements, including quality.

➤ **Respondent feedback**

Table 5.21: Respondent feedback related to the Delphi evaluation

(Source: Own source)

Round 1	Comment
Question 4	The current rating criteria does not reflect the event that has occurred. Agree with peaks but would rate "audit criteria not well defined" higher than recorded. Auditor and audit team variability is mainly caused by different levels of auditor competence (knowledge, experience, qualification and experience).
Round 2	Comment
Q4.1 Terms used in rating audit findings are not well understood	No comments provided.
Q4.2- Rating criteria should only consider quality elements	Neutral- Not really. The auditees see findings from a technical point of view and we should see it from QMS point of view.
Q4.3- Rating criteria should consider elements of safety, reliability and quality	Agree, but what about considering risk? Strongly agree but would expect rating to be biased to quality. Strongly agree, hence, rating criteria should be understood by both auditees and auditors and be beneficial to both,

Feedback, related to the risk ranking exercise was captured in Table 5.22.

Table 5.22: Respondent feedback related to the risk ranking exercise

(Source: Own source)

Feedback comment
It would have been interesting to see the same rankings if not completed by a group of quality professionals – so perhaps a skewed outcome towards quality based on the professional interests of the respondents.
Insufficient information around the problem statement may have caused challenges during this exercise.
Auditor bias may have resulted in variation related to risk source and interpretation of content.
When individuals are not looking objectively at a problem but basing the risk ranking on past experience rather than on the facts, variation may occur.

5.9.4. Related meanings

The research objective was to determine whether risk was consistently identified and considered when rating audit findings; and whether the detection of risks as part of the rating process was consistent amongst participants. In determining this particular research objective, elements that contribute to auditor/ audit team variability were considered.

The exercise revealed that the category of “Auditing methods” as well as the category of “Biased decisions” which speaks directly to objectivity; was identified by most respondents. However during the evaluation of the second research objective previously discussed, dealing with auditor objectivity, the category of “Auditing methods” was not identified. In reviewing the responses to research question 2 and 4 collectively; a disconnection in the opinions related to objectivity and variability were noted. Respondents perceived objectivity to be based pre-dominantly on “Perceived auditor competence and knowledge” and “Auditor qualification and experience”, whereas, variability was perceived to be dependent on the “Auditing methods”. The two concepts, in the researcher’s opinion are inter-dependent and related to each other.

In addition, based on the definition provided for objectivity by Karapetrovic and Willborn (2000:680:**Online**), various aspects come into play including: consistency of the auditing methodology; as well as the mitigation of bias. When the respondents ignore both or one of these aspects, a shortcoming in the holistic understanding of the elements which could affect objectivity is perceived which may also influence the practices related to risk identification, ultimately influencing variability amongst auditors.

In relation to the risk ranking exercise, according to Hubbard (2010) when there is uncertainty about who the measurement is intended for, doubt and indecision about what gets measured may be a resultant outcome.

Even though the respondents unanimously agreed that the rating was not for QA purpose only, but should add value to the auditee; doubt about the validity of this statement is called into question based on the following. In Section 5.8 Figure 5.18, it was noted that a perception existed that the auditee did not understand the purpose of the rating, indicating that the rating was not for the auditee but rather for the auditor.

Furthermore it is perceived that confusion exists amongst respondents related to what risk to identify during the rating process. This was evident in the following way: even though respondents were of the opinion that the rating criteria should consider aspects other than quality, the research observations indicated a conflicting practice. The data collected was skewed towards quality type risk as part of the risk ranking exercise.

Primarily, the researcher is of the opinion that the lack of an applied methodology used to guide risk identification and risk ranking; coupled with an over-reliance on auditor qualification, competence, knowledge, experience, has impacted the decisions made as part of the rating process which may have resulted in variation noted amongst respondents. Therefore, the researcher concludes that risk is not consistently identified and considered when rating audit findings.

5.10. WHAT ELEMENTS INFLUENCE THE CONSISTENCY AMONGST AUDITORS WHEN RATING QMS AUDIT FINDINGS?

The specific information noted in Figure 5.31 was adopted in order to answer the noted research question,

“What elements influence the consistency amongst auditors when rating QMS audit findings?”

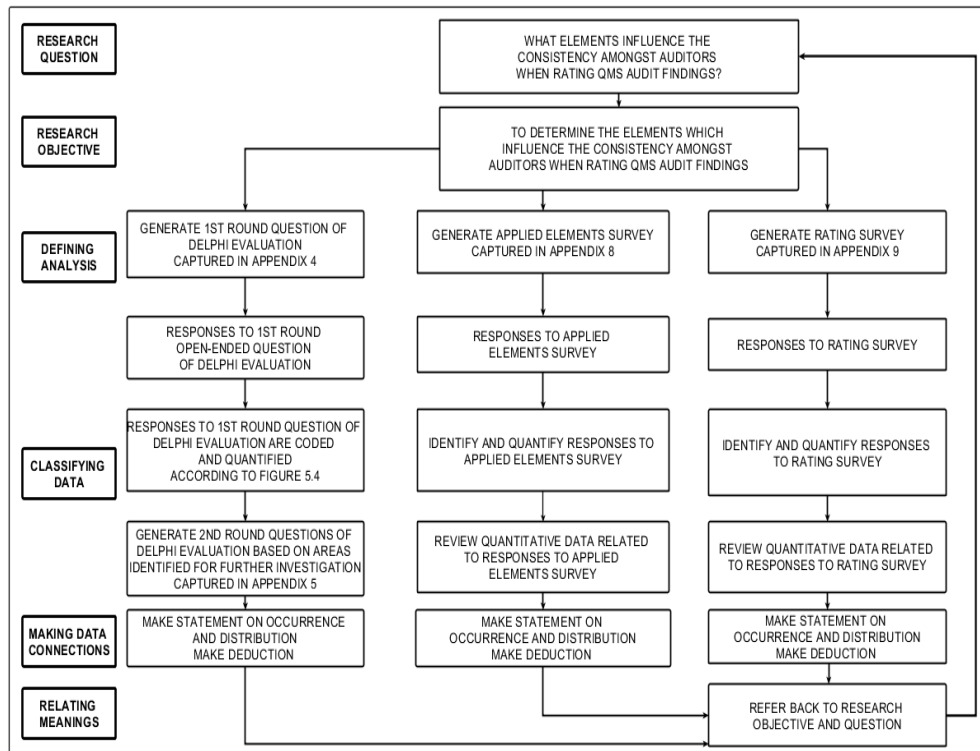


Figure 5.31 Research framework adopted for research question 5

(Source: Own source)

5.10.1. Defining analysis

In order to achieve the research objective, review of the following items was required:

- If variability occurred amongst auditors and audit teams when rating findings, to determine the reasons for inconsistency.
- Determining the elements considered and applied when formulating and rating and audit findings.
- Test consistency amongst participants as part of a rating survey.

5.10.2. Classifying data: Data collection; Analysis and interpretation

The classifying of data will first be discussed for each empirical activity for this research objective before the section related to data connection will be considered.

5.10.2.1 First round of the Delphi evaluation

➤ **Data collection**

As part of the Delphi evaluation, it was decided to review the perceived shortcomings related to the audit rating criteria. The decision was based on: the initial data discussed in Section 2.8, where potential causes for inconsistent audit outcomes were identified; as well as the subsequent data collected in Sections 5.8 and 5.9. The question administered as part of the research question read as follows,

“What are the current shortcomings with the current rating criteria?”

➤ **Analysis and interpretation**

The responses to the first round questionnaire were not tagged using Figure 5.4 but were evaluated against elements noted in Section 3.6.6.3 which referred to the attributes associated with effective criteria for a grading system and included (Institute of Internal Auditors, 2009:6&10:Online):

- **Relevance to the organisation:** Criteria not geared for nuclear environment
- **Reliable, being able to provide accurate data:** Poorly defined criteria
- **Neutral, therefore able to eliminate bias and subjectivity:** Criteria is not QA/QM specific
- **Understood by all parties/stakeholders and considered as value-adding by all:** Criteria not well understood
- **Complete, considering all viewpoints to provide a holistic evaluation of the audit findings:** Criteria too high level/not specific

Using these attributes as a basis for tagging, the responses were evaluated. Once reviewed, responses were quantified and depicted in Table 5.23 and Figure 5.32.

Table 5.23: Data collected during round 1 of the Delphi evaluation

(Source: Own source)

Categories	Frequency	% Occurrence
Criteria is not QA/QM specific	2	40.00
Criteria not geared for nuclear environment	2	40.00
Poorly defined criteria	3	60.00
Criteria not well understood	2	40.00
Criteria does not consider risk and consequence	1	20.00
Criteria too high level/not specific	1	20.00

Referring to Figure 5.32, it was noted that the respondents surveyed were divided about their opinions related to the reasons for the shortcomings of the current rating criteria in the following ways:

- The majority (60%) believed that poorly defined criteria to be the main shortcoming.
- Followed by equal proportions (40% each) believing the reasons for the limitations were: “Criteria is not QA/QM specific”; “Criteria not geared for nuclear environment”; and “Criteria not well understood”.
- The lowest scoring categories, achieving 20% each, was “Criteria does not consider risk and consequence” and “Criteria is too high level/ not specific”

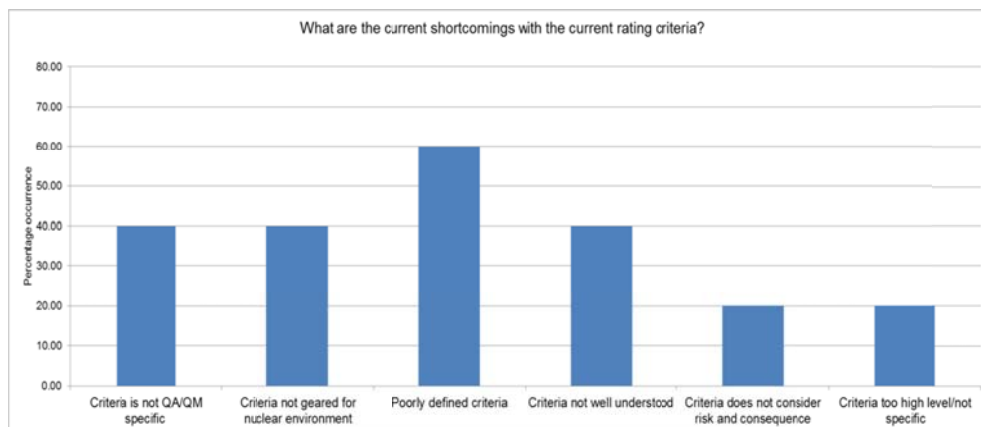


Figure 5.32: Round 1-Question 5

(Source: Own source)

5.10.2.2 Second round of Delphi evaluation

Based on the responses received for round 1 of the Delphi evaluation, and in order to provide insight to both the current research question and the previous research question noted in Section 5.9, which dealt with variability amongst auditors when rating audit findings, the following statements were formulated for the second round of the Delphi evaluation:

- A rating methodology will enhance consistency amongst auditors.
- A four level rating score will enhance consistency amongst auditors.
- Variability in rating findings is based on the current skills set of auditors.

➤ Data collection

The responses noted for this stage of the evaluation were captured in Table 5.24 and graphically noted in Figure 5.33, Figure 5.34, and Figure 5.35.

Table 5.24: Data collected during round 2 of the Delphi evaluation

(Source: Own source)

Q5.1	A rating methodology will enhance consistency amongst auditors	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2		1			
	Participant 3	1				
	Participant 4	1				
	Participant 5		1			
	Participant 6			1		
	Total	2	3	1	0	0
	Percentage occurrence	33	50	17	0	0
Q5.2	A four level rating score will enhance consistency amongst auditors	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1			1		
	Participant 2			1		
	Participant 3			1		
	Participant 4			1		
	Participant 5			1		
	Participant 6			1		
	Total	0	0	6	0	0
	Percentage occurrence	0	0	100	0	0
Q5.3	Variability in rating findings is based on the current skills set of auditors	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	Participant 1		1			
	Participant 2		1			
	Participant 3			1		
	Participant 4	1				
	Participant 5				1	
	Participant 6			1		
	Total	1	2	2	1	0
	Percentage occurrence	17	33	33	17	0

➤ **Analysis and interpretation**

The majority of respondents (83%) averred that a rating methodology may enhance the process of rating an audit finding by enhancing consistency amongst auditors. This is supported by literature where it is noted that objectivity is related to the consistent application of methods in order to mitigate bias (noted in Section 3.5.3).

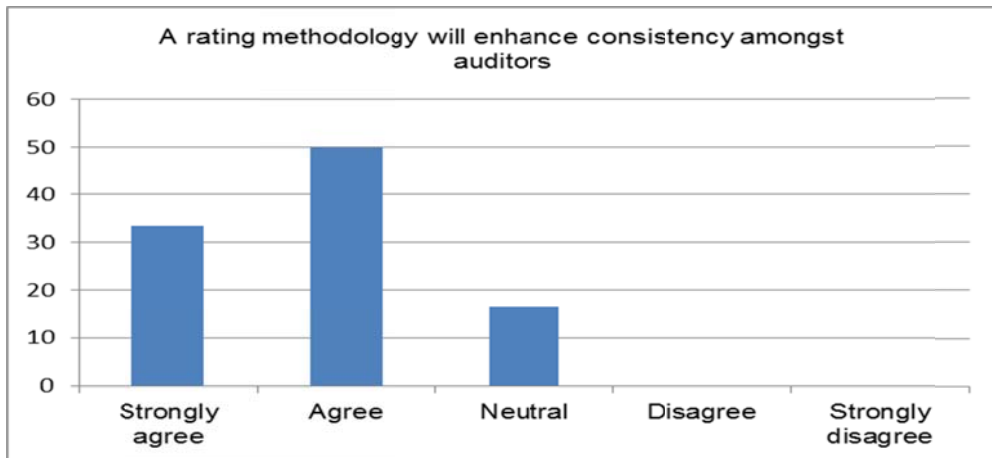


Figure 5.33: Round 2- Q5.1

(Source: Own source)

In the overall Delphi evaluation, this statement related to Q5.2, was the only area where all respondents remained undecided, neither agreeing or disagreeing.

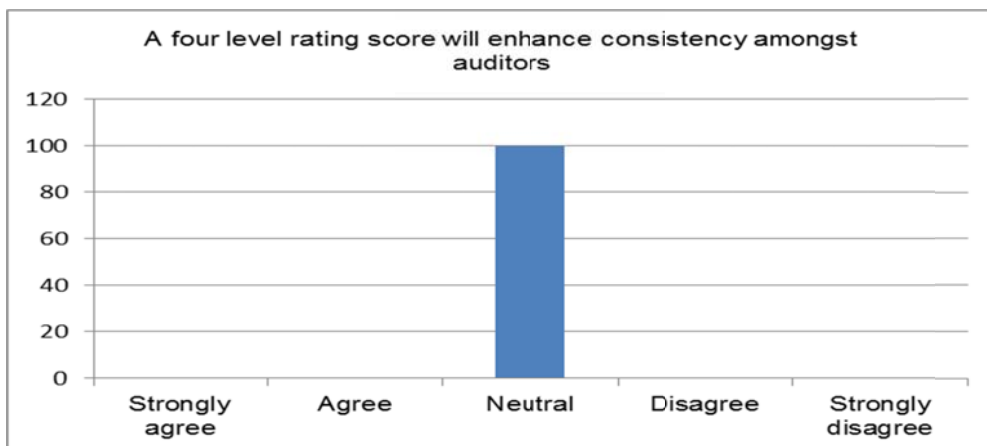


Figure 5.34: Round 2- Q5.2

(Source: Own source)

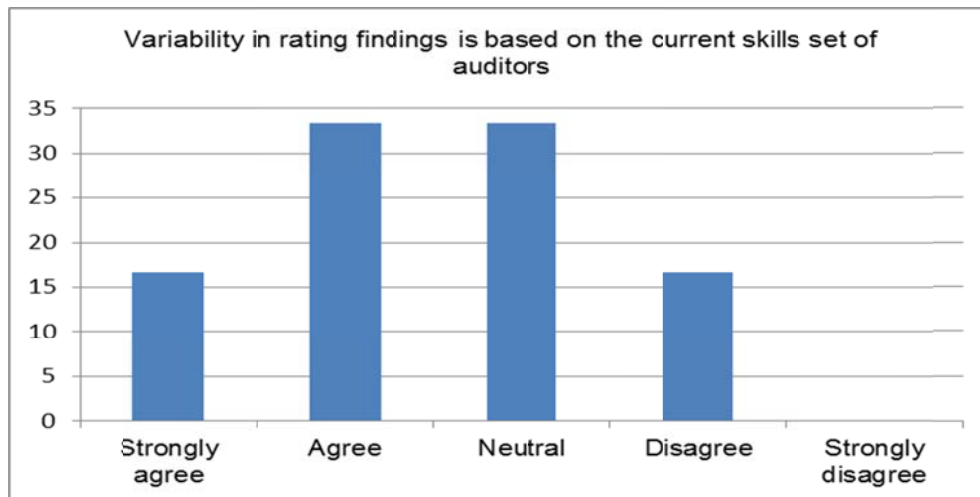


Figure 5.35: Round 2- Q5.3

(Source: Own source)

In reviewing the responses to this statement, a large proportion of respondents (33%) remained undecided regarding the influence an auditor's competency has on rating variability. Half of the respondents agreed that the skill set of auditors may impact the variability related to rating findings. And a smaller proportion (17%) disagreed with this statement.

5.10.2.3 Applied element survey

Besides evaluating the current shortcomings of the audit finding rating criteria, the researcher decided to investigate whether additional elements influenced the consistency amongst auditors when rating QMS audit findings. As part of this investigation, the researcher acknowledged that respondents may have different worldviews, experience and biases. Due to respondents applying all these pre-conceptions to varying degrees, it was highly probable that variation could occur in areas that included:

- The formulation of the audit finding description.
- The rating of the audit finding.
- The formulation of justification description of the audit finding.

For this reason, participants were surveyed to evaluate their general approach when formulating: descriptions, ratings and justifications of audit findings. An example of the category type questionnaire provided to the auditor has been recorded in Appendix 8.

➤ **Data collection**

The responses were captured in Table 5.25 and graphically depicted in Figure 5.36, Figure 5.37 and Figure 5.38 respectively.

Table 5.25: Specific responses captured for applied elements survey

(Source: Own source)

Category	% Occurrence in		
	Formulating	Rating	Justification
Cause	10	0	0
Effect	30	0	0
Consequence	0	10	40
Cause + Effect	10	0	0
Effect + Consequence	50	40	40
Cause+ Effect + Consequence	0	50	20

➤ **Analysis and interpretation**

The data collected as part of this phase of the study was evaluated with the intent to provide a statement on whether similar considerations were taken into account amongst participants when: formulating an audit finding description; rating and audit finding; and providing justification for audit findings.

Before evaluating the specific data collected during this phase of the study, an understanding of the following key concepts was required:

➤ **Cause:** The reason or reasons an event or finding has occurred and can be related to either an action, a condition or lack of an action. Corrective actions are usually determined by the causes identified (Eskom, 2013:6&10).

➤ **Effect:** In quality assurance an effect equates to an occurrence, problem or event. Noted as the “as found” condition and is usually

associated with “objective evidence”. The effect would normally translate directly into the finding description (Eskom, 2015:9).

➤ **Consequence:** The actual or potential resultant or follow-on effect experienced, if the identified condition remains untreated and may potentially be related to a specific risk. The consequence would normally translate directly into the rating of the finding (Eskom, 2013:42).

Each area identified as potentially being influenced by variation was discussed in the subsequent sections.

➤ **Formulation of an audit finding**

When formulating an audit finding description, the various elements were considered in different combinations:

- Half of the respondents considered the cumulative influence of “Effect and Consequence” during the process.
- The rest of the respondents chose three other categories in smaller proportions. The specifics were: 30% chose “Effect”; 10% indicated “Cause + Effect”; and 10% selected “Cause”.
- Of the responses noted by the respondents, three of the four categories included “Effect”.

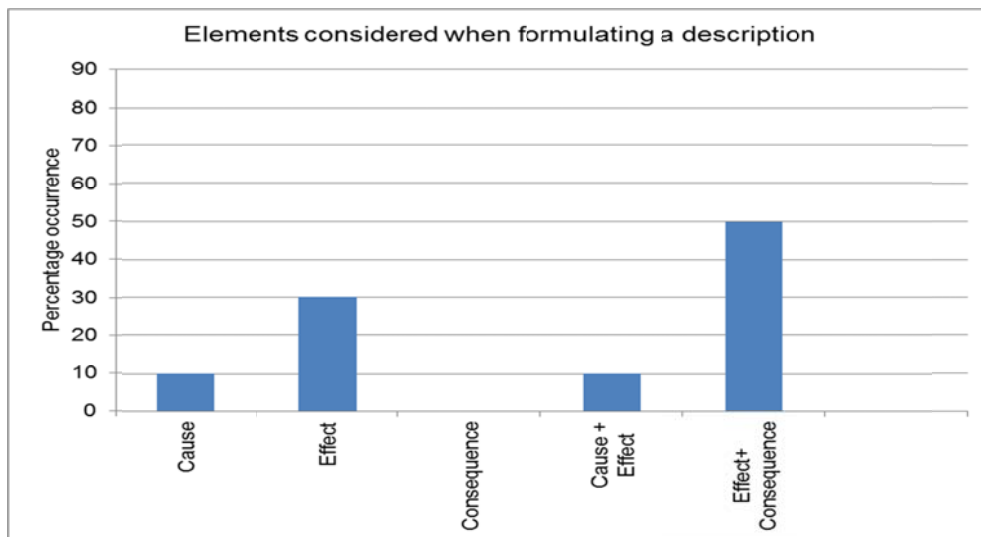


Figure 5.36: Distribution of responses related to finding description

(Source: Own source)

➤ **Rating an audit finding**

Likewise, the related to rating a finding revealed that the various elements were considered in different combinations:

- The category of “Cause + Effect + Consequence” was observed by 50% of the respondents.
- Smaller proportions of two other categories were observed. The specifics were as follows: The category of “Effect + Consequence” scored 40% and the “Consequence” category was selected by 10% of the participants.
- Of the three categories chosen by the respondents, all included “Consequence”.

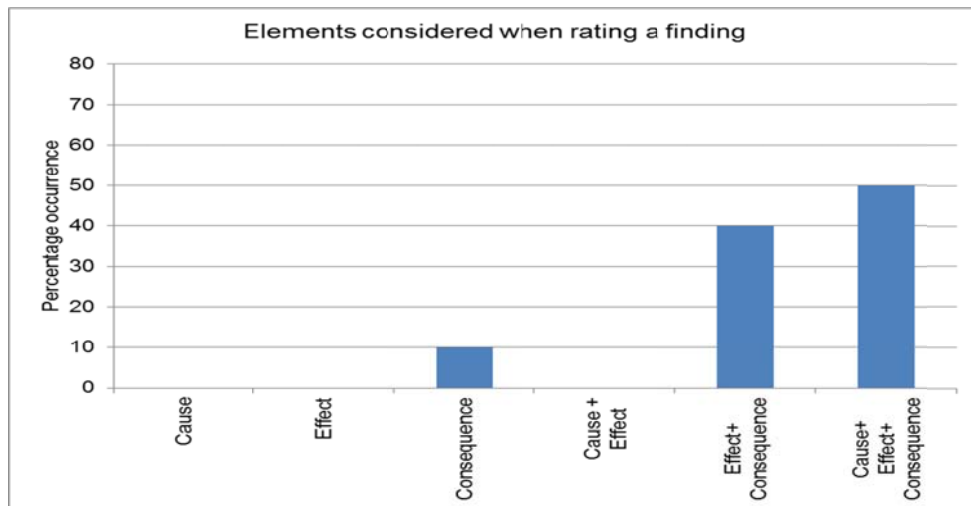


Figure 5.37: Distribution of responses related to rating a finding

(Source: Own source)

➤ **Formulation of an audit finding justification**

During the review of the justification process, three categories were chosen, and all considered “Consequence”. The percentage occurrence for the various categories was noted as follows:

- The categories of “Consequence” and “Effect + Consequence” each occurred 40% respectively.
- And the remaining 20% chose the category of “Cause + Effect + Consequence”.

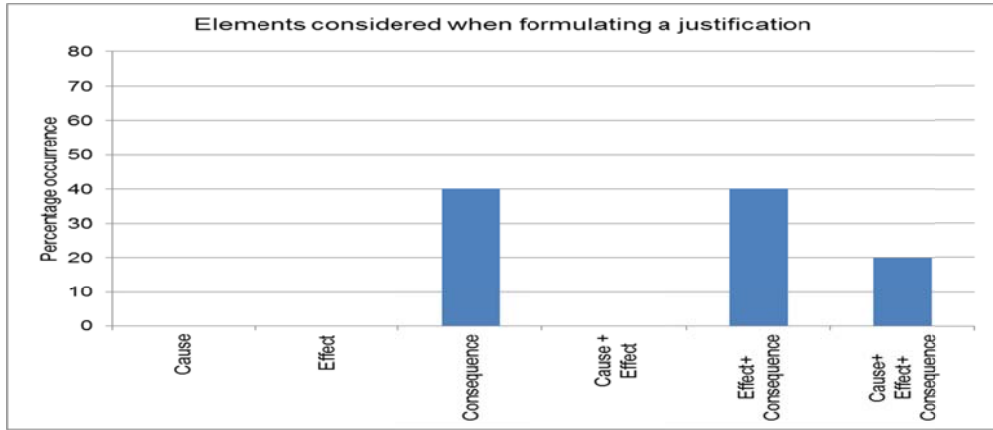


Figure 5.38: Distribution of responses related to formulating a justification
(Source: Own source)

The cumulative distribution was represented in Figure 5.39.

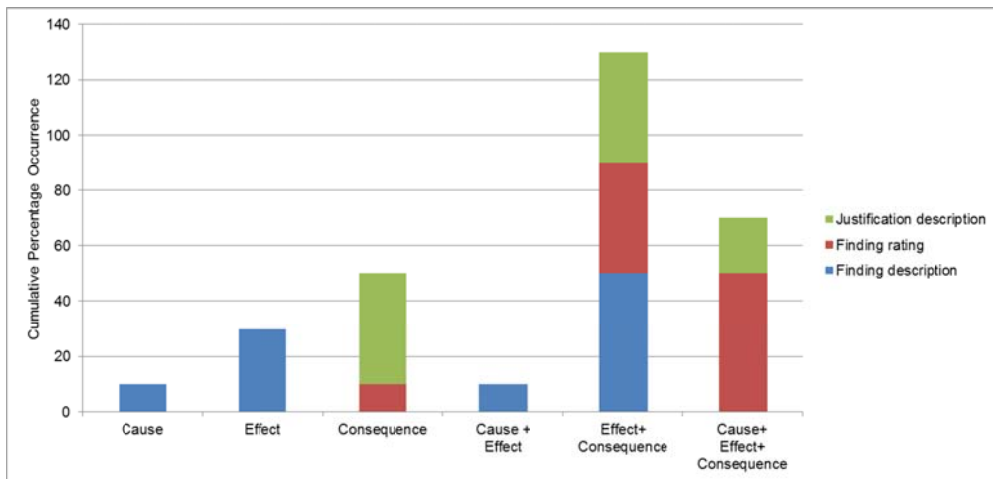


Figure 5.39: Cumulative distribution of responses amongst auditors
(Source: Own source)

In summary, the process of rating a finding indicated the greatest variation in the elements applied, which were either the category of “Effect + Consequence” or “Cause + Effect + Consequence”.

The apparent outcomes of the data represented in Figure 5.39 have been tabulated in Table 5.26 and Table 5.27 using single element and multi-element categories.

Table 5.26: Analysis of the single element categories

(Source: Own source)

Component	Highest scoring category
Finding description	Effect
Finding rating	No conclusive single category was noted. The consequence category was however noted to a lesser extent, when compared to other components
Finding justification	Consequence

Table 5.27: Analysis of multiple element categories

(Source: Own source)

Component	Highest scoring category
Finding description	Effect and Consequence
Finding rating	Cause, Effect and Consequence category noted as the most significant; Followed by Effect and Consequence to a lesser extent
Finding justification	Effect and Consequence

5.10.2.4 Rating survey

In order to rate audit findings it has been noted that a number of input permutations exist amongst participants. In Figure 5.40 the researcher depicted these possible input permutations to formulating, rating and justifying an audit finding based on the data collected in Section 5.10.2.3.

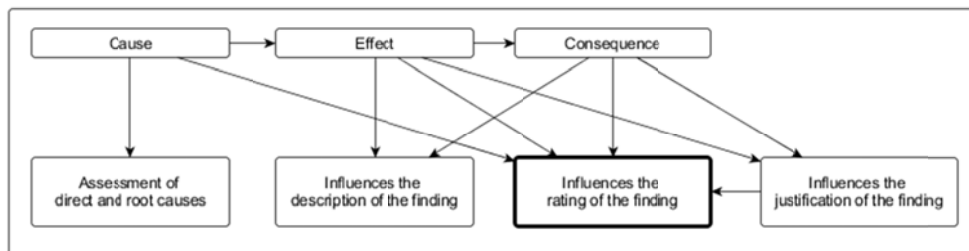


Figure 5.40: Inputs to the rating process

(Source: Own source)

Due to the various permutations possible, as part of the rating exercise, only the audit finding descriptions were provided to the participants who were instructed to rate and provide reasons/justification for rating. The audit finding descriptions did not include the specific criteria used during

the audit or the associated justification descriptions. The reason for this decision will be explained next. Based on Figure 5.40, it was deemed practical to limit the inputs for the rating exercise to its simplest permutation. In addition the following reasons supported the adoption of this approach:

- The number of inputs needing evaluation would be fewer than if all of the combinations were used.
- Data depicting audit finding descriptions was readily available.
- It has been found that the descriptions of findings alone could initiate debates amongst auditors and auditees alike.

Furthermore, Section 5.10.2.3 also provided ample evidence to corroborate the decision by the researcher to only utilise the “effects” or audit finding descriptions. In this section the “Effect and Consequence” category consistently scored the highest frequency for all aspects considered when formulating and rating an audit finding. And since consequences are unknown and subject to auditor bias, it was decided to only consider the effect of the finding and therefore only the finding description would be required as an input to the rating exercise. The exercise would therefore closely reflect the process depicted in Figure 5.41.

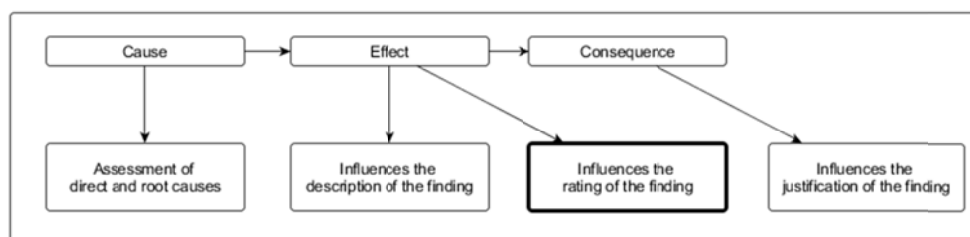


Figure 5.41: Process chosen for the duration of the study

(Source: own source)

➤ **Data collection**

The initial responses to the rating exercise provided by the auditors were captured in Appendix 13. Eleven auditors were surveyed and eleven responses were received, representing a 100% response rate.

➤ **Analysis and interpretation**

The rating for each audit finding as indicated by each participant was collected, recorded and the distribution graphically represented in Figure 5.42.

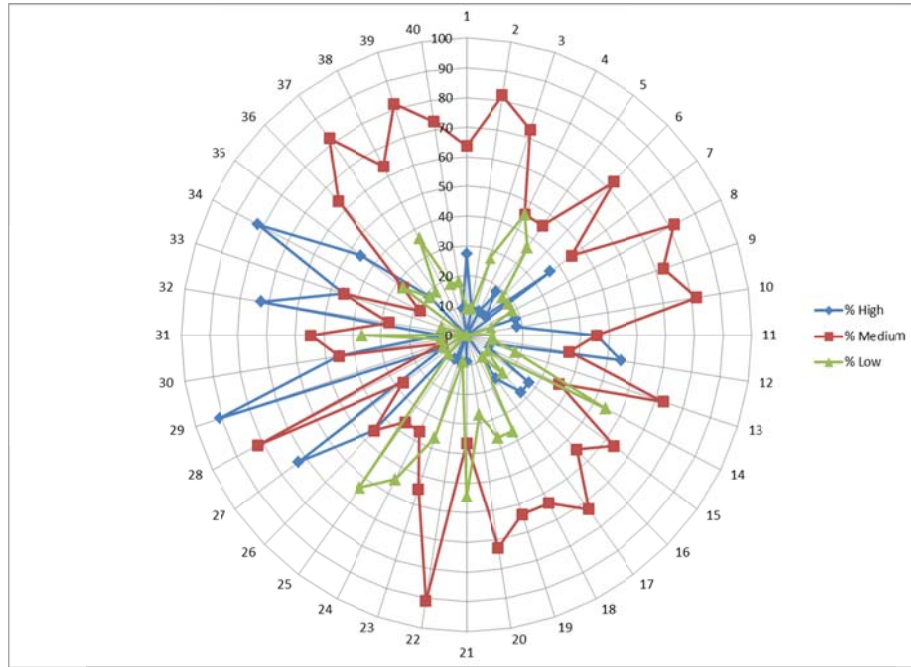


Figure 5.42: Percentage distribution of ratings for each audit finding
(Source: Own source)

From the ratings assigned by the eleven participants, a significant variation in the rating for each finding was noted amongst the participants, with not one finding indicating zero variation.

5.10.2.5 Verifying accuracy

In addition to the rating exercise, each finding used as part of the exercise, had an assigned rating previously recorded. These recorded ratings were considered correct, based on the assumption that these findings were rated by an audit team within the context of an audit activity. The ratings noted during the exercise were then compared to the previously recorded rating. The data in this regard has been recorded in Figure 5.43.

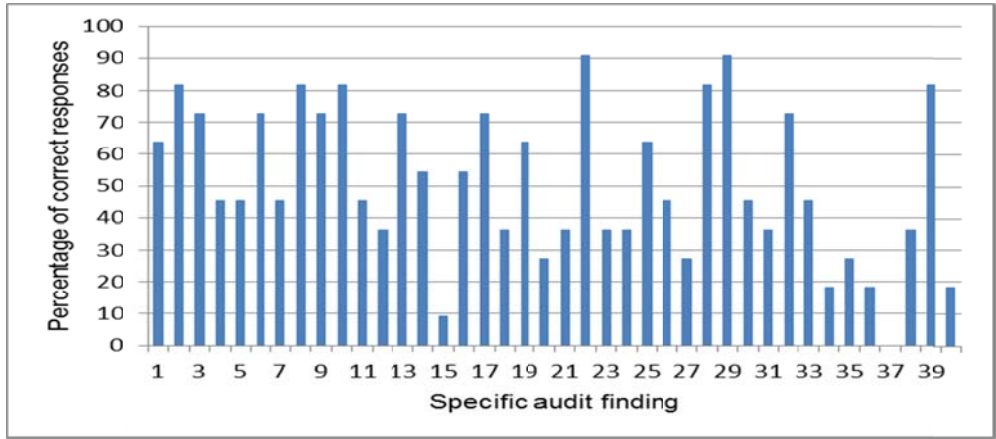


Figure 5.43: Percentage of “correct” rating responses
(Source: Own source)

Of the total findings reviewed, 45% were noted as having more than 50% correct responses. Of these findings, the distribution, according to the grading types was noted as follows:

Table 5.28: Percentage distribution of correct ratings per grading
(Source: own source)

	High	Medium	Low
Number	2	14	2
% Occurrence	11.11	77.78	11.11

5.10.3. Data connections: Researcher’s perspective; Respondent feedback

➤ **Researcher’s perspective**

In order to determine the elements which influence the consistency amongst participants when rating QMS audit findings, the researcher performed three empirical actions.

Based on the Delphi evaluation responses in research question 4 (Section 5.9) and research question 5 (Section 5.10), it was clear that the majority of respondents agreed that the current criteria had some impact on the variation noted amongst participants when rating audit findings. Therefore as part of first round of evaluation, no unanticipated results were observed.

In relation to the second empirical action, which was the applied element survey, the results noted were as anticipated. The researcher perceived that a number of input elements were considered by participants when formulating, rating and justifying a significant audit finding. And as a result, the researcher expected some level of variation to affect the rating of an audit finding.

However, specifically related to the process of rating findings, an unexpected result was noted in that the highest scoring category included *cause* in addition to the elements of effect and consequence. Furthermore, the considerations noted for rating of audit findings noted the highest score for a category which consisted of all three elements, cause, effect and consequence. This is in contradiction to the current documented procedure which calls for a rating to be based on significance and consequence and which is supported by Smith, Bester and Moll (2014:80:**Online**). Similarly, the Institute of Internal Auditors (2009:8:**Online**) also recommended bearing the materiality (effect) of a finding as well as the impact (consequence) of the finding in mind when formulating and evaluating audit findings rather than considering the cause of the finding.

It was also observed that in formulating an audit finding description, half of the respondents considered the cumulative influence of “Effect and Consequence” while the rest of the respondents noted three other categories. This is indicative that variation in the formulation of the audit finding description may also occur.

As part of the third empirical action, the rating exercise, variation was noted across all the findings and across the various types of graded findings. This was expected considering the variation in input elements to the process of formulating, rating and justifying audit findings. In addition the majority of “correct” rated findings were in the medium rated category. This too was expected as historical data indicated that participants were more likely to raise medium rated findings than any other grade of finding.

➤ **Respondent feedback**

Respondent feedback has been noted for all empirical actions performed during the evaluation of this research question. For each activity, the respondent feedback has been tabulated below.

Table 5.30: Respondent feedback related to the Delphi evaluation

(Source: Own source)

Round 1	Comment
Question 5	<p>A rating methodology will definitely enhance consistency as long as it's not complex.</p> <p>The current rating criteria is poorly defined and is therefore inconsistently (or not at all) applied. It also does not talk to consequences/potential consequences and risk to the business area/ organisation or to nuclear safety.</p>
Round 2	Comment
Q5.1- A rating methodology will enhance consistency amongst auditors	<p>Common understanding of "A rating methodology will enhance consistency amongst auditors"</p> <p>Yes, if we define parameters of consistency. We should advocate more for QMS criteria approach. We are not experts on safety and risk. The input space of auditees should align QMS to risk and safety,</p>
Q5.2- A four level rating score will enhance consistency amongst auditors	<p>Depends on the criteria in the different levels.</p> <p>Not sure, depends on what the actual criteria are, we don't want to introduce further indecision or options leading to wavering.</p> <p>Depends on a rating methodology which consider elements of safety, reliability and quality.</p> <p>Levels of rating should not be an issue. The most important aspects of rating should be how it can drive (Priority given to finding) in an attempt to reduce risk to: process/ system erosion and non-compliance so it is to risk of safety and production.</p>
Q5.3- Variability in rating findings is based on the current skills set of auditors	<p>Not limited to skill sets but also personality confidence etc.</p> <p>Rating is a sensitive subject in that it needs to be reviewed in a continuous basis to:</p> <ul style="list-style-type: none"> - validate its existence, - to align it with organisational changes and -to ensure that human resources in organisation are always working from one business scorecard

Table 5.31: Respondent feedback related to the applied element survey

(Source: Own source)

Feedback comment
Very rarely would the cause be used as the basis because this requires an analysis to find the cause. Sometimes the cause is clear, then it can be used. Consequence is difficult to use as this can cause consternation with the auditee as auditors are perceived to not have the expertise to give consequence to their actions. Only when cause and consequence are clear, will it be used.
Cause, effect and consequence may mean different things to different participants.
The cause is not normally known upfront, however the effect is often “displayed” in the objective evidence of the finding.
The consideration of frequency/extent of an issue can also contribute towards escalation of rating. Finding description should be based on what is the real issue.
Rating is based on the effect and/or consequence it will have, possibly the impact.
Experience and the way things have previously been done dictates the way findings are described and graded.

Table 5.32: Respondent feedback related to rating exercise

(Source: Own source)

Feedback comment
Because the current criteria is so vague and of not much help when it comes to ratings, most findings aren't 'high' enough to submit to NNR.
Due to a lack of well-defined rating criteria, medium does seem to be used more often as a gut feel rating.
Poor criteria definition leads to non-use of the existing criteria and therefore medium is the “go to” rating.
Insufficient information around the problem statement, Auditor bias and interpretation of content.

5.10.4. Related meanings

In determining which elements affect consistency amongst auditors when rating audit findings, the following salient points were noted.

When the input elements to formulating an audit finding description were reviewed, the majority of participants identified the inputs as a combination of effect and consequence. Fundamentally, these inputs were presented as residing in the shaded area noted in Figure 5.44.

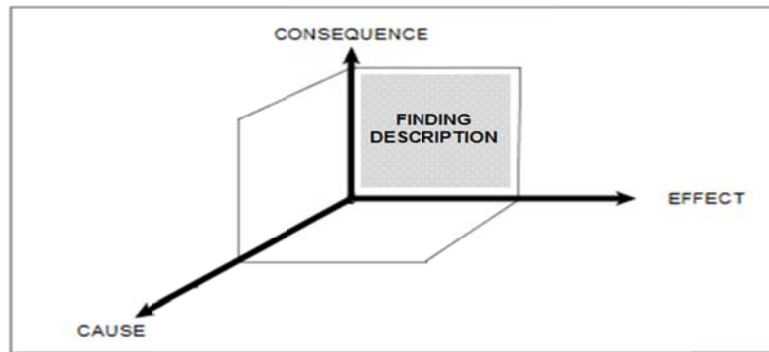


Figure 5.44: Input elements to formulating an audit finding description
 (Source: Own source)

Similarly when the inputs to justifying an audit finding were reviewed, the majority of respondents identified the inputs as a combination of effect and consequence as well. These inputs could be presented similarly to the inputs for the formulation of a finding, therefore being super-imposed on the previous shaded area.

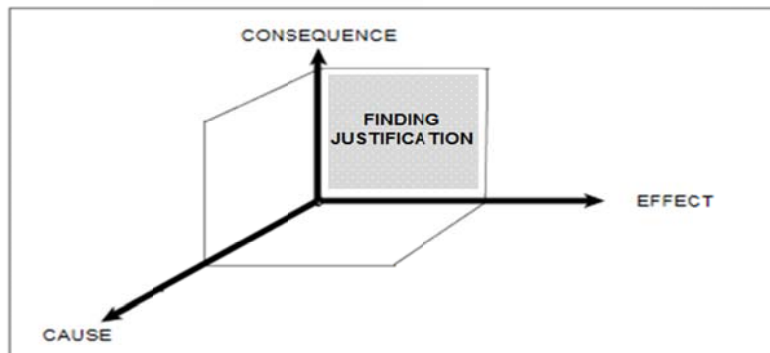


Figure 5.45: Input elements to formulating an audit finding justification
 (Source: Own source)

However, when the input considerations when rating audit findings were reviewed, the majority of the respondents identified the inputs as a combination of cause, effect and consequence. Fundamentally, revealing a different picture to the previously noted items. The area covered by the input elements for rating an audit finding far exceeded the areas noted for categories of formulation and justification of a finding.

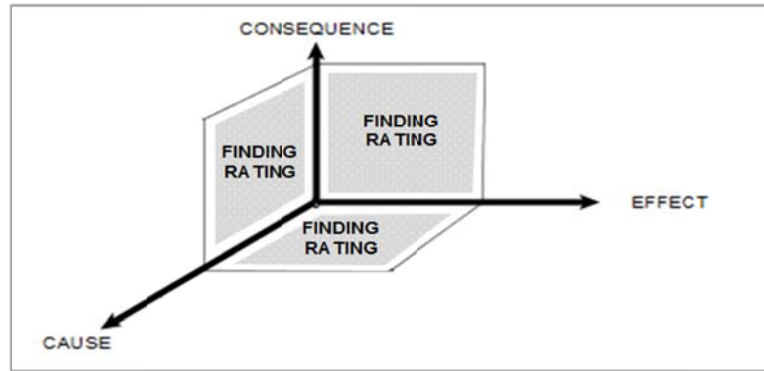


Figure 5.46: Input elements to rating an audit finding
(Source: Own source)

Based on the observation, the rating considers aspects far beyond the effect of the finding and possibly the immediate consequence, the resultant effect is the variation when rating a finding. Therefore, the researcher is of the opinion that the variation observed in the application of input elements when formulating, rating and justifying an audit finding, influences the consistency amongst auditors.

When the purpose of the rating measurement is unclear; guidance regarding what aspects to measure when rating an audit finding, is absent; added to the fact that an applied methodology for rating findings does not exist, it is nearly certain that inconsistency amongst auditors will develop. Furthermore the shortcomings of the current criteria, have forced auditors to apply professional judgement rather than the application of a consistent methodology which has resulted in subjective decisions being made.

As a secondary observation, the confusion about certain terms used during the rating process may require further clarification in order to determine common understanding amongst all stakeholders, including auditors. Whether initial definitions are required, or whether terms need to be clarified, in order to improve the rating process and auditing methods in general, has not been determined as part of this research study.

In summary, the researcher is of the opinion, that the primary reason inconsistencies exist amongst auditors when rating audit findings is due to the variation in input elements as part of the formulation, rating and

justification process. Collectively, the researcher concludes that all the above elements have impacted the level of consistency amongst auditors.

5.11. PRIMARY RESEARCH QUESTION AND ASSOCIATED OBJECTIVE

How will the audit process and the associated outcomes be affected by improving the consistency amongst auditors when rating individual audit findings?

5.11.1. Defining analysis

According to Babbie (2010:51), qualitative studies are usually identifiable by inductive processes where researchers rely on reflection and insight to find meaning to research questions. In support of this statement, Babbie (2010) rendered the following,

“Inductive research begins with observation and proceeds with a search for patterns in what we have observed”.

Therefore in order to address the research question noted above, a holistic review of all the observations performed during the preceding objectives will be performed in order to infer certain conclusions.

5.11.2. Classifying data: Data collection, analysis and interpretation

➤ Data collection

The related meanings formulated throughout the study formed the basis for answering the primary research question.

➤ Analysis and interpretation

Key to appreciating how the audit process and the associated outcomes will be affected by improving the consistency amongst auditors when rating individual audit findings, lies in understanding the purpose of: the audit process; associated audit findings; and the related audit finding ratings.

The literature reviewed as part of this research study revealed that the primary purpose of the audit process is for monitoring and reporting on process elements within the business environment. Consequently, the purpose of the audit finding is to identify anomalies which may inhibit the process from meeting its intended objective or identifying risks to process outputs. In turn the rating of a finding is meant to be indicative of the significance of such a finding.

Related to a stakeholder's point of view, in order to fully benefit from auditing activities and the associated outcomes, stakeholders expect these outcomes to be informative and value-adding. As a result, when stakeholders are unable to detect improvement in business processes, or understand the meaning of associated reporting, the value of the monitoring activities, are called into question.

To effectively report on the anomalies noted during audit activities, it is imperative that critical information is highlighted for information and action to management and auditee alike. And so when audit reporting is ineffective, the effectiveness of the audit process is impacted.

Related to reporting, is the grading of anomalies which can initiate action and appropriate resource allocation. Therefore due to allocation of resources and energy spent in resolving audit findings, the elements used to determine such grading is considered critical. As mentioned previously, in order for any measurement to be effective, certain attributes are required. Attributes such as: understanding the purpose of the measurement; determining for whom the measurement is intended for; determining what elements get measured; and finally, what level of accuracy is required of the measurement (Hubbard, 2010:21). Therefore when the measurement related to the grading of audit findings are ineffective, the reporting is impacted which ultimately impacts the audit process.

Similarly when variation occurs in areas related to audit execution, particularly in the measurement of risks to processes, and the evaluation of such risk, the effectiveness of the audit process is impacted.

Relating this expectation of effective monitoring, measuring and reporting to the research environment, it becomes clear that the need for effective monitoring is a necessity in the nuclear environment where the resolution of significant audit findings become key to safeguarding a nuclear power plant.

Bearing all this in mind and reflecting on the research observations, the following key elements, where limitations and shortcomings were identified, were noted.

- Variation occurred amongst participants regarding their perception of established audit process boundaries.
- Related to the purpose of audit finding ratings, it was found that there was limited correlation between the perceived purpose of rating an audit finding and the methodology/ criteria currently adopted as part of the rating process.
- It was determined that a disconnection existed between how the subject matter regarded and established auditor objectivity versus the way auditor consistency was regarded and established. The two attributes were somehow viewed as separate entities and not related.
- The potential benefit of audit team composition and team dynamics is not fully realised. Based on the observations, a biased to the negative influence of audit team dynamics was noted.
- Elements such as: overall auditee perception; positive marketing strategies; and effective communication strategies, have not been fully appreciated as elements that can affect audit effectiveness.

Referring to Figure 5.47, the elements identified as influencing audit effectiveness in the literature study, was revisited to highlight aspects that may require attention at an operational level, to improve consistency amongst auditors when rating audit findings.

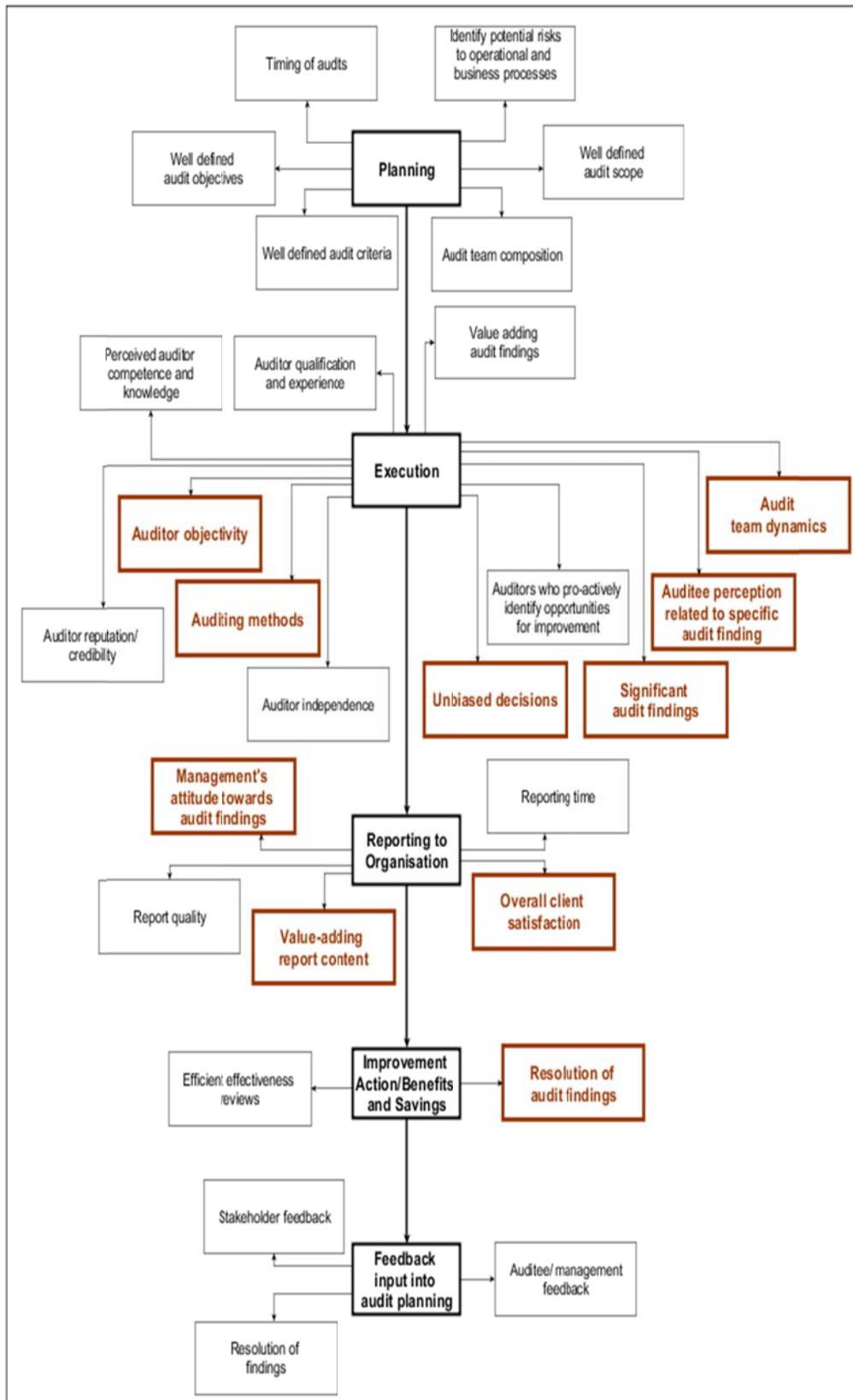


Figure 5.47: Elements affecting audit effectiveness revisited
(Source: Own source)

Finally, in answering the research question,

How will the audit process and the associated outcomes be affected by improving the consistency amongst auditors when rating individual audit findings?

It is inferred by: all the observations noted; associated analyses performed; and the literature reviewed, during the course of the research study that improving the consistency amongst auditors will improve the quality and effectiveness of the audit process and all the associated outcomes.

5.12. CONCLUSION

In meeting the intent of this chapter, the following actions were performed:

- The data collected was analysed using qualitative data analyses.
- Quantitative data was used to support the qualitative data collected.
- Both the researcher's perspective and respondent feedback was used to corroborate the interpretations made.
- And finally, the collective actions which culminated in the key research findings were documented in a manner, in order to meet research objectives and answer all related research questions.

In the concluding chapter that follows, an overview of the completed study will be presented, summarising the following elements:

- The research purpose and related problem statement.
- The research questions and objectives explored during the research study.
- The research design and methodology employed in executing the research study.
- The collection, analysis and interpretation of results.
- The formulated research findings.
- Analysis and recommendations drawn from the research findings.
- Recommendations for further research.
- Finally, the research conclusion.

CHAPTER 6: CONCLUSION

6.1. INTRODUCTION

The research endeavoured by means of exploratory methods to evaluate the factors that may influence the consistency amongst auditors when formulating and rating Quality Management System (QMS) audit findings.

In this chapter the pertinent areas of the research study will be revisited, providing an overview of the completed research study as follows:

- The research problem.
- The research question.
- The investigative sub-questions.
- Research objectives.
- Research design and methodology.
- Data collection, analysis and interpretation of results.
- Research findings.
- Analysis and recommendations drawn from research findings.
- Recommendations for further research.
- Research conclusions.

6.2. THE RESEARCH PROBLEM REVISITED

The stated research problem was as follows,

Inconsistency amongst Quality Management System (QMS) auditors when evaluating individual audit findings has led to an increase in the variability of the resultant audit conclusions.

In addressing this problem, the researcher dissected the audit process to discover the range of elements that influence audit quality and in turn affect audit effectiveness. By means of an extensive literature study, both insight and context was obtained through which the research problem could be evaluated. It is the researcher's opinion that the purpose of the research study has satisfactorily addressed the research problem.

6.3. THE RESEARCH QUESTION REVISITED

The research question investigated was as follows:

How will the audit process and the associated outcomes be affected by improving the consistency amongst auditors when rating individual audit findings?

As part of this exploratory study, all the recorded related meanings noted for each research objective was used to establish the necessary context and insights in order to answer the primary research question by inference. In answering the primary research question, the overall research findings were realised and in so doing the overall research objective was met.

6.4. THE INVESTIGATIVE SUB-QUESTIONS REVISITED

The research study interrogated the following investigative questions:

- What elements affect the effectiveness of the QMS audit process?
- How can the level of objectivity exercised by an auditor be improved when rating audit findings?
- Are specific risks consistently identified and considered when formulating the audit findings?
- Are specific risks consistently identified and considered when rating audit findings?
- What elements influence the consistency amongst auditors when rating audit findings?

Similarly to the primary research question, the extensive literature reviewed as part of this study provided the foundation and context in which to evaluate these questions. Secondly, based on all the data collected, analysed and interpreted within this established context, responses were formulated for all the investigative sub-questions by means of inference.

6.5. RESEARCH OBJECTIVES REVISITED

In order to answer the formulated research questions, the following research objectives were established:

- To determine the elements that affect the effectiveness of the QMS audit process.
- To determine the elements that affect the level of objectivity exercised by an auditor, when rating audit findings.
- To determine whether specific risks are consistently identified and considered when formulating the audit findings.
- To determine whether specific risks are consistently identified and considered when rating audit findings.
- To determine the elements that influence the consistency amongst auditors, when rating audit findings.

In order to meet each research objective, the Delphi technique and various formulated surveys were used successfully to obtain feedback from participants. In doing so, the necessary qualitative and quantitative data was collected, providing the information need to make inferences and draw conclusions related to the current practices in the research environment. In addition, the sequential exploratory technique adopted as part of the research study added validity to the results obtained.

Furthermore, for each research objective, the data analysed and interpreted was evaluated in relation to the literature reviewed, which provided the theoretical grounding for conclusions while addressing all the research objectives.

6.6. RESEARCH DESIGN AND METHODOLOGY REVISITED

Since the purpose and objective of the research study was: to explore and describe the practice amongst auditors when rating audit findings; identify reasons for inconsistencies amongst auditors when rating findings; and provide recommendations to improve both the consistency amongst auditors when rating audit findings and the overall performance of the

audit process, the Delphi technique with elements of a sequential exploratory strategy, seemed like a probable choice for a research method.

Based on the attributes of the of the Delphi technique which included anonymity and controlled feedback, a realistic reflection of a complex situation was discovered by means of the collection, analysis and interpretation of the qualitative and quantitative data.

It is therefore the researcher's judgement that the methodology adopted as part of this study was appropriate and effective in executing the research study.

6.7. DATA COLLECTION, ANALYSIS AND INTERPRETATION OF RESULTS REVISITED

The empirical phase of the study included the collection, analysis and interpretation of data using the qualitative data analysis framework suggested by Baptiste (2001:**Online**). The framework included the following stages:

- Defining analysis.
- Classifying data.
- Making data connections.
- Related meanings.

By adopting this framework, both the researcher's and participant's viewpoints were considered in relation to the data analysis and interpretation. Similarly, inferences were made considering both these viewpoints. In so doing, the researcher provided evidence of rigor in relation to data validity and reliability; and has established credible research conclusions as part this qualitative research study.

6.8. RESEARCH FINDINGS

In addressing each research objective, a sequential exploratory approach was adopted in order to evaluate both qualitative and quantitative data. The purpose of adopting this approach was to: corroborate the research findings; and provide evidence of credible research findings and conclusions.

As previously mentioned, respondent feedback and the researcher's perspective formed a key component of the data analysis and interpretation process.

In addition, the researcher highlighted the significance of the data collected by comparing the data collected for each research objective. Furthermore, the researcher provided insight to the data analysed by utilising the context provided by the literature reviewed.

Therefore through analysis and interpretation of the data collected; corroborated by the researcher and respondent alike; and finally drawing conclusions using various literature sources, the research findings were formulated as follows:

- In the current research environment, it was noted that variation occurred amongst participants regarding their perception of established audit process boundaries.
- Related to the purpose of audit finding ratings, it was found that there was limited correlation between the perceived purpose of rating an audit finding and the methodology/ criteria currently adopted as part of the rating process.
- Auditor objectivity and auditor consistency are inter-dependent concepts. However, it was determined that a disconnection existed between how the subject matter regarded and established auditor objectivity versus the way auditor consistency was regarded and established. The two attributes were somehow viewed as separate entities and not related.

- Currently in the research environment, the potential benefit of audit team composition and team dynamics is not fully realised. Based on the observations, a biased to the negative influence of audit team dynamics was noted.
- In the research environment, elements such as: overall auditee perception; positive marketing strategies; and effective communication strategies, have not been fully appreciated as elements that can affect audit effectiveness.

6.9. ANALYSIS AND RECOMMENDATIONS DRAWN FROM RESEARCH FINDINGS

Based on the key findings, the following analysis and recommendations were noted:

- Based on the differences of perception related to the established audit process boundaries, the following recommendation is proposed:
Establish and document the accepted audit process boundaries. Once the audit boundary is established, determine the associated roles and responsibilities and clarify any related expectations amongst auditors in the research environment to enhance audit process effectiveness.
- Related to the limited correlation between the perceived purpose of rating audit findings and the methodology/criteria currently adopted, the following recommendation is proposed: *Review the intent of the rating process and specify expectations of both the auditor and auditee in this regard. Once the intent of the measurement (rating) is established and understood, determine what indicators/aspects will be measured. Revise the current rating criteria to consider all these inputs.*

- As part of the disconnect noted between the methods used to establish auditor objectivity and methods used to ensure auditor consistency while rating audit findings; and the perceived negative team dynamics, the following recommendation is proposed: *Ensure an applied methodology is formulated and established with clear guidelines related to the finding rating process, always keeping the purpose in mind. Guidelines should include: actions to mitigate individual auditor bias; actions to benefit from positive audit team moderation; actions to eliminate the over-reliance on auditor competency; identify aspects of risk deemed necessary as part of the rating process; and specify inputs to be used as part of formulating, rating and justifying audit findings.*
- In tackling the concern of effectively improving auditee perception, the following recommendation is proposed: *Improve the communication regarding the purpose of rating audit findings; if applicable, communicate clearly the expectations to auditees of required actions in relation to the different finding ratings, and include communication regarding the rating process in presentations used during opening and closing meetings.*

These recommendations have been captured in Figure 6.1 and could be used as a guide for the implementation of the identified recommendations.

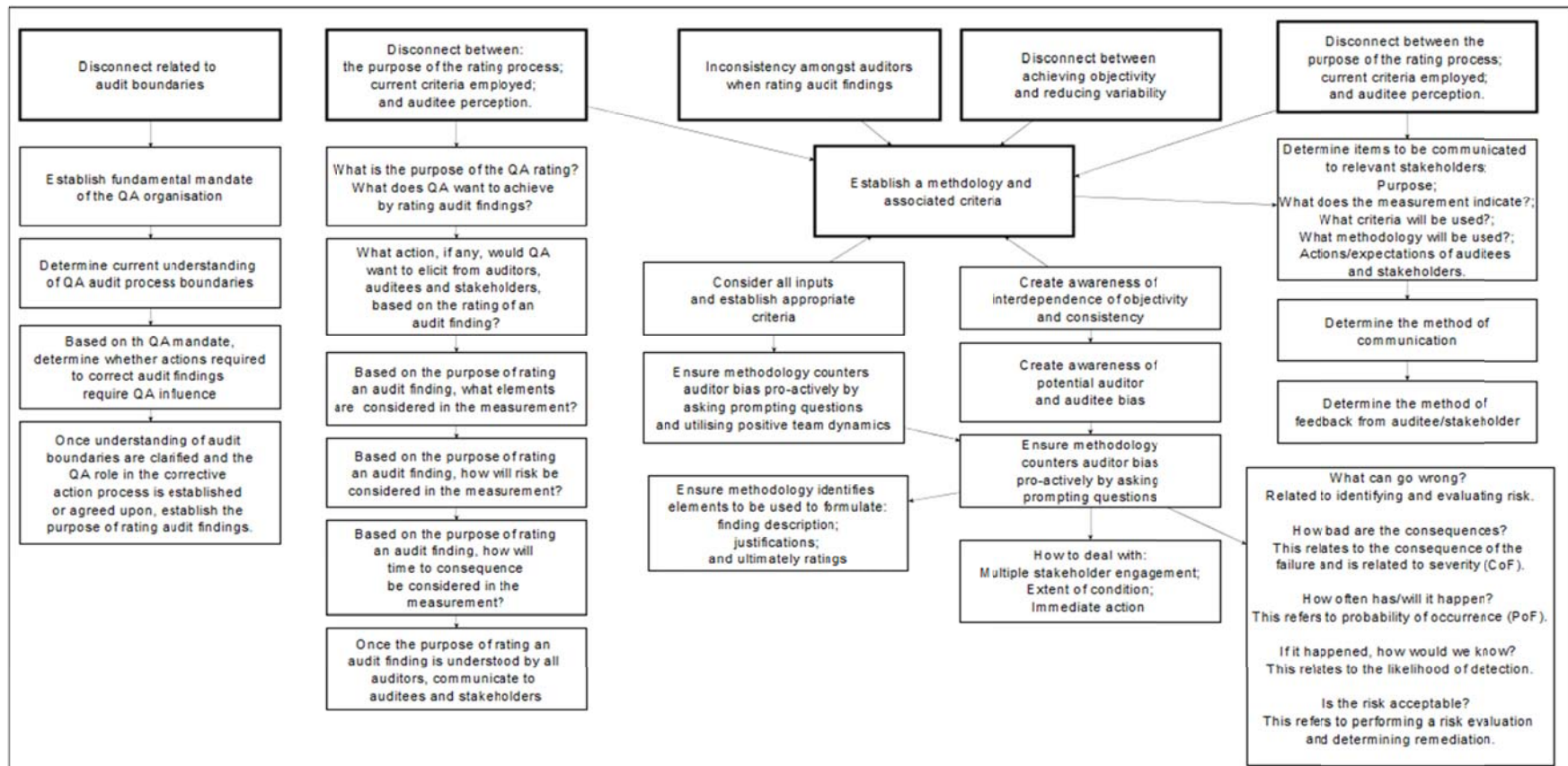


Figure 6.1: High level steps for implementation of recommendations

(Source: Own source)

6.10. RECOMMENDATIONS FOR FURTHER RESEARCH

The following areas have been identified for further investigation:

- Investigate possible rating criteria to be employed as part of the auditing fraternity.
- Investigate a possible rating methodology to be employed as part of the auditing fraternity.
- Evaluate elements that influence audit team dynamics.
- Evaluate aspects that impact the formulation of effective audit objectives.
- Evaluate aspects that impact effective audit planning.
- Evaluate elements that influence auditor competence.

6.11. RESEARCH CONCLUSIONS

The research study endeavoured by means of exploratory methods to: evaluate the factors that may influence the consistency amongst auditors when formulating and rating Quality Management System (QMS) audit findings; potentially identify reasons for inconsistencies amongst auditors when rating audit findings; and provide recommendations to improve both the consistency amongst auditors when rating audit findings and the overall execution and performance of the audit process.

Holistically reviewing the research questions, research objectives, and research findings, the following research conclusion is provided: *The quality assurance role is an essential function in high risk industries such as the nuclear power industry where process failures can potentially have catastrophic results. As part of mitigating the risk inherent in such industries, the need for reliable quality assurance processes executed by competent quality auditors, who are able to objectively and consistently execute their auditing function with a level of repeatability, cannot be over-emphasised. These Quality assurance functions should be based on: reliable and accurate data collection methods; the appropriate analysis of information; the effective identification of risk; as well as effective decision making processes.*

LIST OF REFERENCES

- Alam, I. 2005. Fieldwork and data collection in qualitative marketing research. *Qualitative Market Research: An International Journal*, 8(1):97-112. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/13522750510575462>
- Babbie, E. 2010. *The practice of social research*. Belmont: Wadsworth
- Baptiste, I. 2001. Qualitative Data Analysis: Common Phases, Strategic Differences. *Qualitative Social Research*, 2(3) September. [Online]. Available from: <http://www.qualitative-research.net/index.php/fqs/article/view/917/2003>
- Barthelemy, J. & Zairi, M. 1994. Making ISO 9000 Work: The Role of Auditing. *The TQM Magazine*, 6(3):44-47. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/AED9FE88-F03E-4CE6-960A-6CAEC070BFDA/FinalDownload/DownloadId-98E5882C17EBD982BB451E7C3417F9B5/>
- Beckett, R. & Murray, P. 2000. Learning by auditing: a knowledge creating approach. *The TQM Magazine*, 12 (2):125 - 136. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/AED9FE88-F03E-4CE6-960A-6CAEC070BFDA/FinalDownload/DownloadId-A76118D9C72FDFB481E41CBABCEEDC2D/>
- Beckmerhagen, I. A., Berg, H. P., Karapetrovic, S. V., & Willborn, W. O. 2004. Case study on the effectiveness of the effectiveness of the quality management system audits. *The TQM magazine*, 16(1):14-25. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/AED9FE88-F03E-4CE6-960A-6CAEC070BFDA/FinalDownload/DownloadId-BA0C7DDA0AEC505579FFF45916767F83/>
- Beecroft, G. D. 1996. Internal quality audits –obstacles or opportunities? *Training for Quality*, 4(3):32–34. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/AED9FE88-F03E-4CE6-960A-6CAEC070BFDA/FinalDownload/DownloadId-AA29D0947AC1E047CB86F37895472204/>
- Bergenhengouwen, G.J. 1996. Competence development - a challenge for HRM professionals: core competences of organizations as guidelines for the development of employees. *Journal of European Industrial Training*, 20 (9)29-35. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/03090599610150282>

Blaxter, L. Hughes, C. & Tight, M. 2006. *How to Research*. Berkshire: Open University Press

Bulsara, C. n.d. *Using a mixed methods approach to enhance and validate your research*. [Online]. Available from: http://www.nd.edu.au/3FE91A05-B0C3-4315-9B4E-065CF297C317/FinalDownload/DownloadId-2CBB4155B3DEF04E513F561B04144370/3FE91A05-B0C3-4315-9B4E-065CF297C317/downloads/research/ihr/using_mixed_methods_approach_to_enhance_and_validate_your_research.pdf

Business dictionary.com. n.d. [Online]. Available from: <http://www.businessdictionary.com/definition/objectivity.html>

Calado, R. D., Silva, M. B., Silva, A. A., Oliveira, B.S., Spagnol, G. S., Sarantopoulos, A. & Li, L. M. 2014. Defining quality and maturity level applying the grey system and the method for automotive enterprises diagnosis. *American Journal of Theoretical and Applied Statistics*, 3(6.1):23-34. [Online]. Available from: <http://article.sciencepublishinggroup.com/3BB3F97F-886F-4636-890E-DDAAABFBCD4D/FinalDownload/DownloadId-7A60528F270599FD16B335D7A907C683/3BB3F97F-886F-4636-890E-DDAAABFBCD4D/pdf/10.11648.j.ajtas.s.2014030601.13.pdf>

Caputo, A. 2013. A literature review of cognitive biases in negotiation processes. *International Journal of Conflict Management*, 24 (4):374-398. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/IJCMA-08-2012-0064>

Cheetham, G. & Chivers, G. 1998. The reflective (and competent) practitioner: a model of professional competence which seeks to harmonise the reflective practitioner and competence-based approaches. *Journal of European Industrial Training*, 22(7):267-276. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/03090599810230678>

Cheetham, G. & Chivers, G. 2000. A new look at competent professional practice. *Journal of European Industrial Training*, 24(7):374-383. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/03090590010349827>

Colbert, J. L. & Alderman, W. C. 1995. A risk-driven approach to the internal audit. *Managerial Auditing Journal*, 10(2):38-44. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02686909510079648>

Creswell, J.W. 2009. *Research design: Qualitative, quantitative, and mixed method approaches*. California: Sage publications

Creswell, J.W. 2003. *Research design: Qualitative, quantitative, and mixed method approaches*. [Online]. Available from:
http://isites.harvard.edu/A9242438-B3AA-4BE4-931E-2A208D1E9185/FinalDownload/DownloadId-493580FB4FBBAF9EEAB58853A355FA31/A9242438-B3AA-4BE4-931E-2A208D1E9185/fs/docs/icb.topic1334586.files/2003_Creswell_A%20Frame%20work%20for%20Design.pdf

Das, A., Maiti, J. & Banerjee, R.N. 2012. Process monitoring and fault detection strategies: a review. *International Journal of Quality & Reliability Management*, 29 (7):720 - 752. [Online]. Available from:
<http://www.emeraldinsight.com/9A6F3670-5753-4061-AC49-BA7525F4E911/FinalDownload/DownloadId-821A539268D5A6D95332FF0B35950DCD/>

Department of Minerals and energy. 1999. National Nuclear Regulator Act 47.

Deribe, W.J. & Regasa, D.G. 2014. Factors Determining internal audit quality: empirical evidence from Ethiopian commercial banks. *Research Journal of Finance and Accounting*, 5(23):86-94. [Online]. Available from:
<http://www.iiste.org/Journals/index.php/RJFA/article/view/18480/18747>

Duff, A. 2009. Measuring audit quality in an era of change
An empirical investigation of UK audit market stakeholders in 2002 and 2005. *Managerial Auditing Journal*, 24(5):400-422. [Online]. Available from:
<http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02686900910956784>

Elliot, M., Dawson, R., & Edwards, J. 2007. An improved process model for internal auditing. *Managerial Auditing Journal*, 22(6):552-565. [Online]. Available from:
<http://www.emeraldinsight.com.ezproxy.cput.ac.za/AED9FE88-F03E-4CE6-960A-6CAEC070BFDA/FinalDownload/DownloadId-112F1E7A7A98161AB245EFD90AD9C5B0/>

Eskom Internal Procedure, KAA-688, The Corrective Action Process. 2013. Eskom, Koeberg Nuclear Power Station, Internal Process Document.

Eskom Internal Procedure, KAA-832, Quality Assurance Monitoring Processes. 2012. Eskom, Koeberg Nuclear Power Station, Internal Process Document.

Eskom Internal Procedure, KAA-021, Quality Assurance Administrative Processes for Audits, Reviews And Surveillance. 2012. Eskom, Koeberg Nuclear Power Station, Internal Process Document.

Eskom. n.d. *Nuclear Energy: Koeberg Power Station*. [Online]. Available from:
<http://www.eskom.co.za/AboutElectricity/FactsFigures/Documents/Nuclear.pdf>

European committee for standardization. 2008. Risk-Based Inspection and Maintenance Procedures for European Industry (RIMAP). BS CWA 15740 CEN

Fadzil, F.H., Haron, H., & Jantan, M. 2005. Internal auditing practices and internal control system. *Managerial Auditing Journal*, 20(8):844-866. [Online]. Available from:
<http://www.emeraldinsight.com.ezproxy.cput.ac.za/AED9FE88-F03E-4CE6-960A-6CAEC070BFDA/FinalDownload/DownloadId-F675D3CE24D837B6BBFCF1901C7E5C42/>

Firescu, V. 2014. Positionings and delimitations concerning the performance audit. *Practical Application of Science*. 2(4): 49-56. [Online]. Available from: http://www.sea.bxb.ro/Article/SEA_6_8.pdf

Frosdick, S. 1997. The techniques of risk analysis are insufficient in themselves. *Disaster Prevention and Management: An International Journal*, 6(3):165-177. [Online]. Available from:
<http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/09653569710172937>

Gehman, J., Lefsrud, L. & Lounsbury, M. 2014. Perspectives on risk: from techno-economic calculations to socio-cultural meanings. [Online]. Available from:
http://www.cspg.org/cspg/documents/Conference%20Website/Oil%20Sands/Session_F/F_Oral_4_Gehman_et_al.pdf [Accessed 25/08/2014]

Hassall, T., Dunlop, A. & Lewis, S. 1996. Internal audit education: exploring professional competence. *Managerial Auditing Journal*, 11(5):28-36. [Online]. Available from:
<http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02686909610120514>

Hsu, C. & Sandford, B.A. 2007. The Delphi Technique: Making Sense Of Consensus. *Practical Assessment, Research & Evaluation*, 12(10)1-8. [Online]. Available from: <http://pareonline.net/F2670247-32C8-449B-9F77-E65A0BABF378/FinalDownload/DownloadId-E713F68099F856002D1A9FDE045625E8/F2670247-32C8-449B-9F77-E65A0BABF378/pdf/v12n10.pdf>

Hubbard, D.W. 2010. *How to measure anything*. New Jersey. John Wiley & Sons, Inc.

Inaki, H.S., Landín G.A. & Fa, M.C. 2006. A Delphi study on motivation for ISO 9000 and EFQM. *International Journal of Quality & Reliability Management*, 23 (7):807-827. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02656710610679824>

Institute of Internal Auditors. 2009. *Formulating and expressing internal audit opinions*. [Online]: Available from: https://www.theiia.org/chapters/pubdocs/87/OPINIONS_PRACTICE_GUIDE_FINAL.PDF

International Atomic Energy Agency. 2014. *Use of a graded approach in the application of the management system requirements for facilities and activities*. [Online]. Available from: http://www-pub.iaea.org/MTCD/Publications/PDF/TE-1740_web.pdf

Jack, E. P. & Raturi, A.S. 2006. Lessons learned from methodological triangulation in management research. *Management Research News*, 29(6):345-357. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/01409170610683833>

Jackson, S.L. 2011. *Research Method: A Modular Approach*. Belmont: Wadsworth

Jeary, R. 2012. Nuclear Industry UK Research into current and future quality professional skill needs. *Chartered Quality Institute*. [Online]. Available from: <http://www.thecqi.org/Documents/knowledge/UK%20Nuclear%20Industry%20Research%20A4.pdf>

Jonsen, K. & Jehn, K. A. 2009. Using triangulation to validate themes in qualitative studies. *Qualitative Research in Organizations and Management: An International Journal*, 4(2):123-150. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/17465640910978391>

Kakkad, S. & Ahuja, P. 2014. Implementation of Total Quality Management in a construction firm. *International Journal of Science, Engineering and Technology Research*, 3(10), October: 2653-2658. [Online]. Available from: <http://ijsetr.org/wp-content/uploads/2014/10/IJSETR-VOL-3-ISSUE-10-2653-2658.pdf>

Karapetrovic, S. & Willborn, W. 2000. Quality assurance and effectiveness of audit systems. *International Journal of Quality & Reliability Management*, 17(6): 679-703. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02656710010315256>

Karapetrovic, S. & Willborn, W. 2001, Audit and self-assessment in quality management: comparison and compatibility. *Managerial Auditing Journal*, 16(6):366-377. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/2BDD52D2-741D-4BC7-A495-F050249D86C3/FinalDownload/DownloadId-EE911CAB42AF290F6E33CED9D14CC7CF/2BDD52D2-741D-4BC7-A495-F050249D86C3/doi/pdfplus/10.1108/02686900110395505>

Kendrick, T. 2004. Strategic risk: am I doing ok? *Corporate Governance*, 4(4):69-77. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/14720700410558899>

Keogh, W. 1994. The role of the quality assurance professional in determining quality costs. *Managerial Auditing Journal*, 9(4):23 - 32. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02686909410056356>

Lacey, A. & Luff, D. 2007. Qualitative Research Analysis. *International Institute for Health Research*. [Online]. Available from: http://www.rds-yh.nihr.ac.uk/wp-content/uploads/2013/05/9_Qualitative_Data_Analysis_Revision_2009.pdf

Law, P. 2008. An empirical comparison of non-Big 4 and Big 4 auditors' perceptions of auditor independence. *Managerial Auditing Journal*, 23(9):917-934. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02686900810908454>

Leedy, P.D & Omrod, J.E. 2005. *Practical research. Planning and design*. New Jersey: Pearson Education.

Lévêque, F. 2013. The risk of a major nuclear accident: calculation and perception of probabilities. *Interdisciplinary Institute for Innovation*, (2), July: 1-37. [Online]. Available from: http://hal.archives-ouvertes.fr/docs/00/84/13/96/PDF/I3WP_13-ME-02_2.pdf

Leveson, N. n.d. *A Systems Approach to Risk Management Through Leading Safety Indicators*. [Online]. Available from: <http://sunnyday.mit.edu/B60D2502-F2D9-4699-850A-7D3F4C2A83BF/FinalDownload/DownloadId-6309856DED2638A40C36EC2B5EA97635/B60D2502-F2D9-4699-850A-7D3F4C2A83BF/papers/leading-indicators-final.pdf>

Lindsay, P.R. & Stuart, R. 1997. Reconstructing competence. *Journal of European Industrial Training*, 21 (9):326-332. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/03090599710189216>

Mangan, J., Lalwani, C. & Gardner, B. 2004. Combining quantitative and qualitative methodologies in logistics research. *International Journal of Physical Distribution & Logistics Management*, 34(7):565-578. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/09600030410552258>

Mohamed, D. M. & Habib, M.H. 2013. Auditor independence, audit quality and the mandatory auditor rotation in Egypt. *Education, Business and Society: Contemporary Middle Eastern*, 6(2):116- 144. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/CBDCB21E-E3D4-4747-99CC-3133C8085000/FinalDownload/DownloadId-B0767F2078F82D954662ECB2F29CF7DA/CBDCB21E-E3D4-4747-99CC-3133C8085000/doi/pdfplus/10.1108/EBS-07-2012-0035>

Mouton, J. 2001. *How to succeed in your Master's & Doctoral studies*. Pretoria: Van Schaik.

Paliwoda, S. J. 1983. Predicting the Future Using Delphi. *Management Decision*, 21(1):31-38. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/eb001309>

Paraskevas, A. & Saunders, M. N. K. 2012. Beyond consensus: an alternative use of Delphi enquiry in hospitality research. *International Journal of Contemporary Hospitality Management*, 24(6):907-924. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/09596111211247236>

Philip C., Howze, P.C. & Dalrymple, C. 2004. Consensus without all the meetings: using the Delphi method to determine course content for library instruction. *Reference Services Review*, 32(2):174-184. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/00907320410537694>

- Pyzdek, T. & Keller, P. 2013. *Handbook for Quality Management: A Complete Guide to Operational Excellence*. New York: McGraw-Hill Education. [Online]. Available from <http://accessengineeringlibrary.com/browse/handbook-for-quality-management-a-complete-guide-to-operational-excellence-second-edition/c9780071799249ch10?s.num=11&start=10&q=auditor>
- Rajendran, M. & Devadasan, S.R. 2005. Quality audits: their status, prowess and future focus. *Managerial Auditing Journal*, 20 (4):364-382. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02686900510592052>
- Rampersad, H. K. 2001. *Total Quality Management, An executive guide to continuous improvement*. Berlin: Springer.
- Robitaille, D. 2014. *9 Keys to successful Audits*. Chico: Paton Professional.
- Romero, S. 2010. Auditor independence: third party hiring and paying auditors. *EuroMed Journal of Business*, 5 (3):298- 14. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.zadoipdfplus10.110814502191011080827>
- Sarens, G. and De Beelde, I. 2006. Internal auditors' perception about their role in risk management: A comparison between US and Belgian companies. *Managerial Auditing Journal*, 21(1):63-80. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/2BDD52D2-741D-4BC7-A495-F050249D86C3/FinalDownload/DownloadId-88E499E36361416D96A3D9762DB59601/2BDD52D2-741D-4BC7-A495-F050249D86C3/doi/pdfplus/10.1108/02686900610634766>
- Sinkovics, R. R., Penz, E. & Ghauri, P. N. 2005. Analysing textual data in international marketing research. *Qualitative Market Research: An International Journal*, 8 (1):9-38. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/13522750510575426>
- Skulmoski, G. J., Hartman, F. T. & Krahn, J. 2007. The Delphi Method for Graduate Research. *Journal of Information Technology Education*, 6:(1-21). [Online]. Available from: <http://jite.org/documents/Vol6/JITEv6p001-021Skulmoski212.pdf>
- Smith R., Bester A. & Moll CM. 2013. Measuring Quality Management System performance using quantitative analyses. A dissertation submitted in fulfilment of the requirements for the degree Magister Technologiae in the Faculty of Engineering at the Cape Peninsula University of Technology

Smith R., Bester A. & Moll CM. 2014. Quantifying Quality Management System performance in order to improve business performance. *South African Journal of Industrial Engineering*, 25(2):75-95 [Online]. Available from: http://www.scielo.org.za/scielo.php?pid=S2224-78902014000200008&script=sci_arttext

Sobh, R. & Perry, C. 2006. Research design and data analysis in realism research. *European Journal of Marketing*, 40(11):1194 - 1209. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/03090560610702777>

South African National Standard. SANS 19011:2012:Guidelines for auditing management systems. [Online]: Available from: http://intranetupdate.eskom.co.za/library/sabs_docs/pdf/SANS19011.pdf

South African national standard. SANS 9000:2005: Quality management systems— Fundamentals and vocabulary. [Online]: Available from: http://intranetupdate.eskom.co.za/library/sabs_docs/pdf/SANS9000.pdf

South African National Standard. SANS 9001:2008: Quality management systems—Requirements. [Online]: Available from: http://intranetupdate.eskom.co.za/library/sabs_docs/pdf/SANS9001.pdf

South African National Standard. SANS 9004:2010: Managing for the sustained success of an organization — A quality management approach. [Online]: Available from: http://intranetupdate.eskom.co.za/library/sabs_docs/pdf/SANS9004.pdf

Swetnam, D. 2004. *Writing Your dissertation. How to plan, prepare and present successful work*. United Kingdom: How To Content.

The Chartered Quality Institute. n.d. *Driving Organisational Excellence*. [Online]. Available from: http://www.thecqi.org/PageFiles/11844/Competency_Framework.pdf

The Institute for internal auditors. n.d. [Online]. Available from: <https://na.theiia.org/standards-guidance/topics/Pages/Independence-and-Objectivity.aspx>

Tummala, V.M.R. & Leung, Y.H. 1996. A risk management model to assess safety and reliability risks. *International Journal of Quality & Reliability Management*, 13 (8):53-62. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02656719610128493>

- Turner, R. 2014. *Handbook of Project-Based Management: Leading Strategic Change in Organizations*. [Online]. Available from: <http://accessengineeringlibrary.com/browse/handbook-of-project-based-management-leading-strategic-change-in-organizations-fourth-edition/c9780071821780ch14#c9780071821780ch14lev1sec02>
- Turoff, M. & Linstone, H. A. 2002. *The Delphi Method: Techniques and Applications*. [Online]. Available from: <http://is.njit.edu/DE552453-5DD8-4EA1-8E9D-8946E79D30FA/FinalDownload/DownloadId-C93332C8C26348A4339A5289D4EE308D/DE552453-5DD8-4EA1-8E9D-8946E79D30FA/pubs/delphibook/delphibook.pdf>
- Vakani, F. & Sheerani, M. 2012. How to gain consensus from a group of non-experts – an educationist perspective on using the Delphi technique. *Development and Learning in Organizations: An International Journal*, 26 (4):20-22. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/14777281211249923>
- Vanasco, R. R. 1996. Auditor independence: an international perspective. *Managerial Auditing Journal*, 11 (9):4-48. [Online]. Available from: <http://www.emeraldinsight.com.ezproxy.cput.ac.za/doi/pdfplus/10.1108/02686909610150386>
- Walliman, N. 2011. *Research methods The basics*. USA: Routledge:
- Welman, J.C. & Kruger, S.J. 2001. *Research Methodology for Business and administrative Sciences*. South Africa: Oxford University Press Southern Africa.
- Wisniewski, S. & Porter, M. n.d. *Quality Risk Management (QRM)*. [Online]. Available from: <http://www.ispe-casa.org/F2670247-32C8-449B-9F77-E65A0BABF378/FinalDownload/DownloadId-0F0DCA41984049F61FA0BAA4F9A39387/F2670247-32C8-449B-9F77-E65A0BABF378/sites/default/files/Effective%20Implementation%20of%20a%20Risk%20Management%20Program%20Jan%2029.%202013.pdf>
- World nuclear association. n.d. [Online]: Available from: <http://www.world-nuclear.org/info/Current-and-Future-Generation/World-Energy-Needs-and-Nuclear-Power/>
- Zikmund, W.G. 2003. *Business research methods*. United States of America: Thomson South-Western.

Appendix 1: Criteria for rating of the audit finding

Rating	Criteria
High	<ol style="list-style-type: none"> 1. the auditee does not comply with legal or regulatory requirements 2. there are safety (OH&S) act contraventions and health of people and plant is at risk 3. there is a major equipment damage or defects and/or operational nonconformities relative to the subject being monitored that will have serious plant health and/or financial impact 4. there is an important contravention of an Eskom or Generation policy, standard, directive or Environmental, Safety or Quality programme
Medium	<ol style="list-style-type: none"> 1. there is a risk of load loss and/or discontinuity of supply in the station 2. there is a risk of lack of reliability (i.e. through a lack of continuous monitoring) 3. there is a risk of a unit trip 4. there are defects or operational nonconformances relative to the audit subject that may have moderate impact on plant health and/or have financial impact 5. There is a repeat of a low rated non-conformance from previous audits
Low	<ol style="list-style-type: none"> 1. There are housekeeping issues (cleanliness, demarcation of work areas, administrative discipline, data capturing and records) 2. There are minor defects or defects of operational nonconformances relative to the audit subject that may have minimal impact on plant health and/or financial impact in the short term

Appendix 2: Criteria for rating audit activity

Rating	Criteria
Met	<p>1.1. Zero Nonconformity.</p> <p>1.2. Minimal or zero observations with potential to result in nonconformity in future.</p>
Mostly Met	<p>2.1. Nonconformity (NCs) do not materially impact on the ability of the process to achieve its intended output.</p> <p>2.2. Typically a number NCs rated low within a large number of audit criteria.</p> <p style="text-align: center;">OR</p> <p>2.3. A number of medium NCs within a large number of audit criteria. A number of observations with potential to result in nonconformities in future</p>
Partly Met	<p>3.1. Non-conformities prevent the process from consistently achieving its intended output.</p> <p>3.2. Typically a large number of medium NCs within a small number of audit criteria.</p> <p style="text-align: center;">OR</p> <p>3.3. A few high NCs within a large number of audit criteria. Large number of observations with potential to result in nonconformities in future</p> <p>3.4. There have been recent examples where processes has not consistently achieved its intended output, with the nonconformity as the root cause.</p> <p>3.5. There are open NCs from previous audits, which add to the risk that the process does not meet its intended objectives.</p>
Not Met	<p>4.1. Nonconformities completely prevent the process from achieving its intended output.</p> <p>4.2. Typically a few high NCs within a small number of audit criteria.</p> <p style="text-align: center;">OR</p> <p>4.3. A large number of medium NCs within a small number of audit criteria.</p> <p>4.4. The significance/risk posed by the NCs have a direct link with the overall output of the process.</p> <p>4.5. There have been recent examples where processes has not consistently achieved its intended output, with the nonconformity as the root cause.</p> <p>4.6. There are open NCs from previous audits, which add to the risk that the process does not meet its intended objectives.</p>

Appendix 3: Historical audit data evaluated for the period 2008-2010

Activity	Rating of Nonconformities				Percentage distribution of Nonconformities			Activity rating
	High	Medium	Low -	Grand Total	% High	% Medium	% Low	
1	2	5	1	8	25	63	13	Not Met
2	1	1		2	50	50	0	Partly Met
3			1	1	0	0	100	Partly Met
4		3		3	0	100	0	Partly Met
5	1	1		2	50	50	0	Partly Met
6			1	1	0	0	100	Mostly Met
7		1		1	0	100	0	Partly Met
8		1		1	0	100	0	Partly Met
9		1		1	0	100	0	Partly Met
10		2		2	0	100	0	Partly Met
11		1		1	0	100	0	Partly Met
12		2		2	0	100	0	Partly Met
13		9		9	0	100	0	Partly Met
14		3	1	4	0	75	25	Partly Met
15		3		3	0	100	0	Partly Met
16		3	3	6	0	50	50	Partly Met
17		2		2	0	100	0	Mostly Met
18		1		1	0	100	0	Mostly Met
19		2	1	3	0	67	33	Mostly Met
20		1	7	8	0	13	88	Partly Met
23			1	1	0	0	100	Mostly Met
24		1		1	0	100	0	Not Met
25			1	1	0	0	100	Mostly Met
26		2		2	0	100	0	Partly Met
27		1		1	0	100	0	Partly Met

Activity	Rating of Nonconformities				Percentage distribution of Nonconformities			
	High	Medium	Low	Grand Total	% High	% Medium	% Low	Activity rating
28		3	2	4	0	75	25	Partly Met
29		1		1	0	100	0	Mostly Met
30		1		1	0	100	0	Mostly Met
31			2	2	0	0	100	Mostly Met
32			1	1	0	0	100	Partly Met
33		1		1	0	100	0	Partly Met
34		13		13	0	100	0	Not Met
35		1		1	0	100	0	Partly Met
36			1	1	0	0	100	Mostly Met
37		1	2	3	0	33	67	Mostly Met
38		1		1	0	100	0	Mostly Met
39		3	2	5	0	60	40	Partly Met
40		3	2	5	0	60	40	Mostly Met
41			1	1	0	0	100	Mostly Met
42			2	2	0	0	100	Mostly Met
43		13	4	17	0	76	24	Partly Met
44		1		1	0	100	0	Mostly Met
45	1	2	2	5	20	40	40	Partly Met
46	3	2	2	7	43	29	29	Partly Met
47		4	1	5	0	80	20	Mostly Met
48			3	3	0	0	100	Mostly Met
49		3	2	5	0	60	40	Mostly Met
50			1	1	0	0	100	Mostly Met
51			1	1	0	0	100	Mostly Met
52		1		1	0	100	0	Mostly Met
53		2		2	0	100	0	Mostly Met

Activity	Rating of Nonconformities			Grand Total	Percentage distribution of Nonconformities			Activity rating
	High	Medium	Low		% High	% Medium	% Low	
54		1	1	2	0	50	50	Partly Met
55		1		1	0	100	0	Mostly Met
56			3	3	0	0	100	Partly Met
57			4	4	0	0	100	Partly Met
58		2		2	0	100	0	Partly Met
59		1	1	2	0	50	50	Mostly Met
60		1		1	0	100	0	Mostly Met
61			1	1	0	0	100	Mostly Met
62		2	1	3	0	67	33	Mostly Met
63		3	2	5	0	60	40	Mostly Met
64			6	6	0	0	100	Mostly Met
65			2	2	0	0	100	Mostly Met
66		6	6	12	0	50	50	Not Met
67		1	5	6	0	17	83	Mostly Met
68			1	1	0	0	100	Mostly Met
69		1	4	5	0	20	80	Mostly Met
70		2	2	4	0	50	50	Mostly Met
71		2		2	0	100	0	Mostly Met
72		3		3	0	100	0	Mostly Met
73		2		2	0	100	0	Mostly Met
74		1	1	2	0	50	50	Mostly Met
75		3		3	0	100	0	Not Met
76		4		4	0	100	0	Mostly Met
77			3	3	0	0	100	Mostly Met
78			1	1	0	0	100	Mostly Met
79		3		3	0	100	0	Partly Met
80			1	1	0	0	100	Mostly Met
81		1		1	0	100	0	Partly Met
82	2	1	2	5	40	20	40	Partly Met

Appendix 4: First iteration of the Delphi questionnaire

Instructions:

- 1 Please read each statement and question carefully
- 2 Please provide as much detail as possible regarding your opinions, supporting with examples, if possible.

Item	Statements	Response
1	The audit process/system consist of multiple steps, inputs and outputs. In your opinion, list three (3) elements that affect the effectiveness of the audit process? (Please list in order of priority- listing the highest priority item first).	<i>Provide a list</i>
2	The role of the auditor is a critical part in the audit process. In your opinion, list three (3) elements that affect the objectivity of an auditor? (Please list in order of priority- listing the highest priority item first).	<i>Provide a list</i>
3	QA auditors currently rate/grade audit findings (nonconformities). In your opinion, why do QA auditors rate/grade audit findings?	<i>Provide summary of your thoughts</i>
4	The level of consistency amongst auditors and audit teams may vary in practice when rating audit findings and activities. In your opinion, list three (3) elements that contribute to auditor/ audit team variability?(Please list in order of priority- listing the highest priority item first).	<i>Provide a list</i>
5	The audit finding (nonconformity) is rated using a rating criteria. In your opinion, what are the current shortcomings with the current rating criteria?	<i>Provide summary of your thoughts</i>

Appendix 5: Second iteration of the Delphi questionnaire

Instructions:

- 1 Carefully review the results from the first questionnaire found below (see graphs)
- 2 Please comment on the data presented (*optional*)
- 3 Please rate the associated statement (*mandatory*)
- 4 Provide any additional comments

Please comment on the data presented in the graphs below.	Please rate the associated statement (X)	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Q1 <i>Provide summary of your thoughts.</i>	Q1.1 Significant audit findings can affect audit effectiveness					
	Q1.2 Value-adding report content can affect audit effectiveness					
	Q1.3 Effective resolution of audit findings can affect audit effectiveness					
Q2 <i>Provide summary of your thoughts.</i>	Q2.1 Audit team dynamics can affect auditor objectivity					
	Q2.2 Individual auditor bias can affect auditor objectivity					
	Q2.3 QA's organisational position can affect auditor objectivity					
Q3 <i>Provide summary of your thoughts.</i>	Q3.1 The reason for rating audit findings is not well understood by auditees					
	Q3.2 Rating audit findings is for QA use only					
	Q3.3 Rating audit findings is an indication of risk					
Q4 <i>Provide summary of your thoughts.</i>	Q4.1 Terms used in rating audit findings are not well understood					
	Q4.2 Rating criteria should only consider quality elements					
	Q4.3 Rating criteria should consider elements of safety, reliability and quality					
Q5 <i>Provide summary of your thoughts.</i>	Q5.1 A rating methodology will enhance consistency amongst auditors					
	Q5.2 A four level rating score will enhance consistency amongst auditors					
	Q5.3 Variability in rating findings is based on the current skills set of auditors					

Appendix 6: Rating criteria considerations

Instructions

- 1 Could you please complete the following table using no more than five minutes.
- 2 Which criteria would you use when rating the following type of findings?

High	
Medium	
Low	

Appendix 7: Risk ranking survey

Item	NC Description	Quality	Safety	Plant	Regulatory
1	The storage of original				
2	The lack of an all				
3	There is an over-				
4	The level of detail				
5	There are outstanding				
6	There is a lack of c				
7	Incomplete records				
8	The responsibility				
9	The modification				
10	The roles and r				
11	The verification of c				
12	The review of con				
13	The contracts files				
14	The process for o				
15	There is no process				
16	Anomalies were n				
17	Implementation of				
18	The documented				
19	Organograms do				
20	Changes to the				
21	The records for				
22	There are positions				
23	Records originating				
24	Not all requirements				
25	The documented				
26	The acceptance of				
27	Records associated				
28	The KAA-743 process				
29	Policies and Protocols				
30	The current process				
31	There were instances				
32	Inadequate interfacing				
33	The identification				
34	There is inadequate				
35	The Occupational				
36	Plant surveillances				
37	Completed surveillance				
38	Contradictions				
39	Some of plant				
40	Records of out				

Appendix 8: Applied elements survey

Instructions:

1. Complete the cover sheet with all the details required.
2. Please answer each question by only selecting **ONE** (1) of the options provided.
3. Please provide any comment you believe will add value to the overall understanding of your choices in the space provided

Item	Question	Cause	Effect	Consequence	Cause + Effect	Effect+ Consequence	Cause+ Effect+ Consequence
1	Which aspect do you consider when formulating a description for an audit finding?						
2	Which aspect do you consider when rating an audit finding?						
3	Which aspect do you consider when formulating a justification for an audit finding?						
4	Any general comments you may deem important for information and/or clarification:						

Appendix 9: Rating survey

Item	NC Description	High	Medium	Low
1	The storage of			
2	The lack of an all			
3	There is an over-			
4	The level of detail			
5	There are			
6	There is a lack of c			
7	Incomplete records			
8	The responsibility			
9	The modification			
10	The roles and r			
11	The verification of c			
12	The review of con			
13	The contracts files			
14	The process for o			
15	There is no			
16	Anomalies were n			
17	Implementation of t			
18	The documented			
19	Organograms do			
20	Changes to the			
21	The records for			
22	There are positions			
23	Records originating			
24	Not all requirements			
25	The documented			
26	The acceptance of			
27	Records associated			
28	The KAA-743			
29	Policies and			
30	The current			
31	There were			
32	Inadequate			
33	The identification			
34	There is inadequate			
35	The Occupational			
36	Plant surveillances			
37	Completed			
38	Contradictions			
39	Some of plant			
40	Records of out			

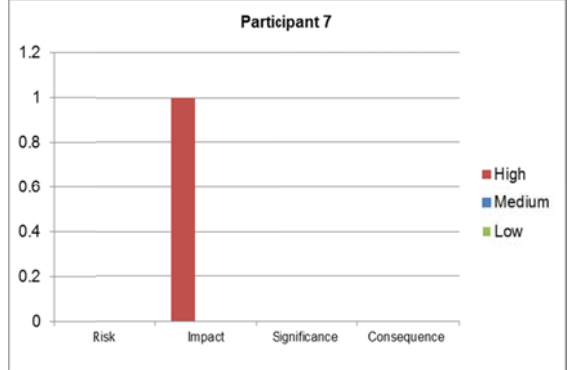
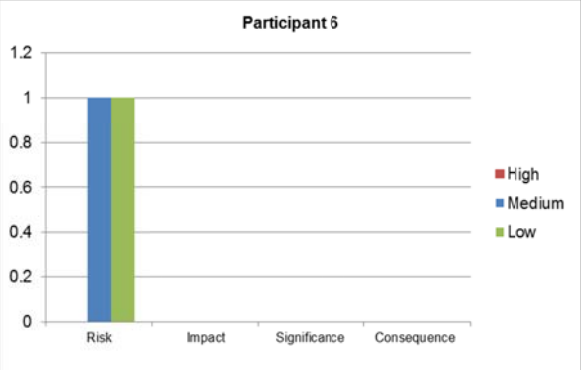
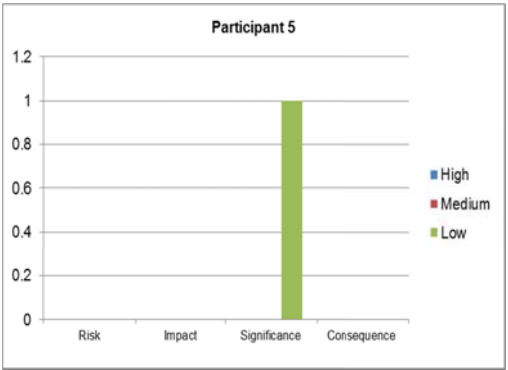
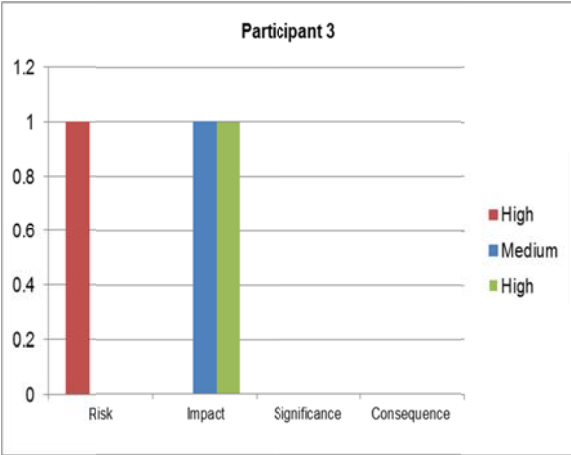
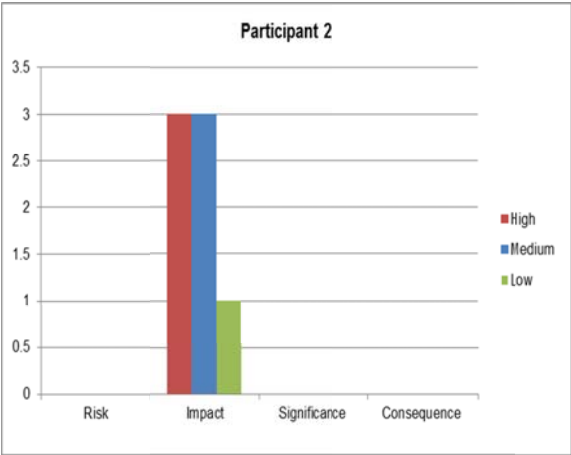
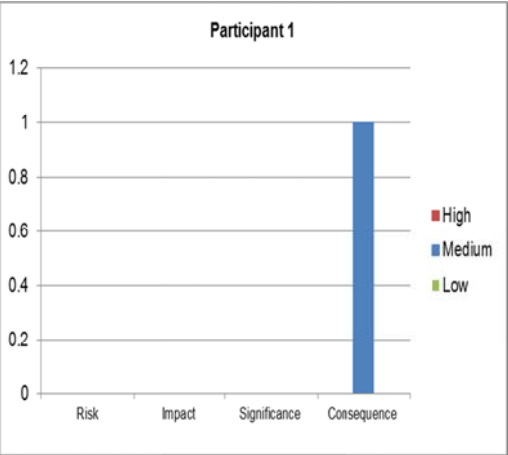
Appendix 10: Response to round 1 of the Delphi evaluation

Statements	Response 1	Response 2	Response 3	Response 4	Response 5
<p>The audit process/system consist of multiple steps, inputs and outputs.</p> <p>In your opinion, list three (3) elements that affect the effectiveness of the audit process?</p> <p>(Please list in order of priority- listing the highest priority item first).</p>	<p>1. Planning,</p> <p>2. Execution (Auditee responses),</p> <p>3. Reporting timelines</p> <p>PLANNING</p> <p>EXECUTION</p> <p>REPORTING TIMES</p>	<p>1. Adequate preparation by the Lead in terms of what they want to look at, scoping and informing the team members as to their workscope timeously.</p> <p>2. Detailed preparation by team members in terms of understanding their process areas and going through their allocated documents with a fine toothcomb</p> <p>3. Daily team meetings to discuss areas of concern for further follow up /gathering of objective evidence</p> <p>SCOPE</p> <p>TEAM COMPOSITION</p> <p>AUDIT TEAM DYNAMICS</p>	<p>1. Preparation :the more you prepare, the better the chances of have a successful audit. Key element of your prep is defining the objective and the scope.</p> <p>2. Going through the process documents in the area you auditing, which will help one narrow the scope of the audit to best achieve the objectives. Identifying the gate keepers of each process, the interfaces (people and processes).</p> <p>3. Reporting: If you report is not based of objectives, it loses the impact, if its not covering gate keepers/or identifying risks in acheiving what is intended for the process, it should also indicate whether or not the objectives of the audit were met. Another key element would be how soon do does one communicates the audit report, the timing is the key, as issuing the report too late also leads to the audit losing its impact and as your final output, its vital that the reports gets issued to the relevent audience timiously for them to attend to process non-conformities ASAP as to prevent process breakdown.</p> <p>PLANNING</p> <p>REPORT CONTENT</p> <p>SIGNIFICANT AUDIT FINDINGS</p> <p>REPORTING TIME</p>	<p>1. Audit environment knowledge and experience.</p> <p>2. Audit preparation.</p> <p>3. Audit stakeholder communication & commitment</p> <p>QAULIFICATION AND EXPERIENCE</p> <p>PLANNING</p> <p>MANAGEMENT'S ATTITUDE TOWARDS FINDINGS</p>	<p>1. Develop a proper scope</p> <p>2. Good timeous preparation.</p> <p>3.daily feedback meeting with audit team members</p> <p>AUDITOR QUALIFICATION AND EXPERIENCE</p> <p>PLANNING</p> <p>MANAGEMENT'S ATTITUDE TOWARDS FINDINGS</p> <p>SCOPING</p> <p>PLANNING</p> <p>AUDIT TEAM DYNAMICS</p>
<p>The role of the auditor is a critical part in the audit process.</p> <p>In your opinion, list three (3) elements that affect the objectivity of an auditor? (Please list in order of priority- listing the highest priority item first).</p>	<p>1. Proper planning,</p> <p>2. Auditor understanding of the process,</p> <p>3.Team member(auditors) participation</p> <p>PLANNING</p> <p>COMPETENCE</p> <p>AUDIT TEAM DYNAMICS</p>	<p>1. Inadequate preparation could result in the auditor not being clear as to what they are looking for, and therefore allowing themselves to be led to "areas of concern" by the hidden agendas of the auditee.</p> <p>2. Being emotionally roped into the auditees world during interviews - ie: feeling sorry for the auditee and empathising with their situation, rather than sticking to whether or not they are complying to their process.</p> <p>3. As internal auditors, we work in an environment where we know a number of our auditees on a friendly level - this could result in issues being overlooked or downplayed if the person doesn't have the ability to separate professional work-type discussions from more personal-type discussions.</p> <p>PLANNING</p> <p>BIAS+OBJECTIVITY</p> <p>INDEPENDENCE</p>	<p>1. Knowledge about the process being audited (again goes down to mostly preparation, depending on the area being audited,</p> <p>2.Some technical experience is advantageous but this can be compensated by thorough preparation)</p> <p>KNOWLEDGE</p> <p>PLANNING</p> <p>EXPERIENCE</p>	<p>1. Ability to see the wood for the trees. Experience.</p> <p>2. Ability to separate own personal bias towards auditees/audit environment from the audit scope.</p> <p>3. Maturity to be able to recognise 1 & 2 and own SWOT.</p> <p>EXPERIENCE</p> <p>BIAS+OBJECTIVITY</p> <p>OBJECTIVITY</p>	<p>1. Knowledge or understanding of criteria and evidence presented.</p> <p>2. Being able to read people i.e. know whether the auditee is dealing with a vendetta.</p> <p>3.Common sense linked with technical savvy.</p> <p>KNOWLEDGE AND EXPERIENCE</p> <p>COMPETENCE</p> <p>COMPETENCE</p>

Appendix 10: Response to round 1 of the Delphi evaluation

Statements	Response 1	Response 2	Response 3	Response 4	Response 5
QA auditors currently rate/grade audit findings (nonconformities). In your opinion, why do QA auditors rate/grade audit findings?	Determining risks, how will this NC effect the process in future if its allowed to continue? ID RISK SIGNIFICANT	For me, the rating of the nonconformity relates to the severity of the issue being raised, and I would like to see it directly linked to the time taken to resolve the issue. So a High rated NC should really be a priority for the line group to resolve, not longer than 2 or 3 months, because what we're saying to the auditee is 'listen up guys, if we continue like this, someone or something is going to break'. So the High rating to me is really reflective of instances where we can significantly harm someone, are breaking the law or where the status quo can really cause damage to the plant. ID RISK SIGNIFICANT	It should be based on how critical is the output of that process (regulatory or statutory, affects a SR or CRS component, does it lead to process failure...etc)/what is the consequence of not complying, what are the risks associated with the NC) ID RISK SIGNIFICANT	1. Places findings in context (small admin issue vs system breakdown). 2. Able to rank findings based on ratings, to ensure the more serious issues are highlighted to the correct level. ID RISK SIGNIFICANT	To give to the auditee a sense of urgency or to address the NC and in some way to convey risk. In the past this was not done especially when you audit suppliers or contractors as it was in their best interest to get the NCs sorted so that they can get the contract. With mature orgs it is the same as they want to improve their system by addressing the issues immediately. ID RISK SIGNIFICANT
The level of consistency amongst auditors and audit teams may vary in practice when rating audit findings and activities. In your opinion, list three (3) elements that contribute to auditor/ audit team variability?(Please list in order of priority- listing the highest priority item first).	1. Knowledge of the topic, 2. Seeing the long term effects/risks, 3. Is there a breakdown of the process? KNOWLEDGE BIASED DECISIONS UNABLE TO ID RISK TO PROCESS AUDING METHODS	1. The lack of a credible rating system for rating of both NCs and audit activities. 2. Inadequate definition of terms used in the rating criteria so that it is likely that 2 different people will be able to interpret or apply the information in the same way. 3. Frequent training as a group will improve consistency - going through exercises and debating/ get consistency amongst ourselves in thinking about the application of the rating system. (As an example, at each workshop there can be a 1 hour slot where 3 sample NCs can be rated by each member of the group using the rating criteria, and then see how many of us come up with the same rating. If not why not & if all align how did we come to that conclusion). With time, we will start aligning in our thinking. POORLY DEFINED CRITERIA POORLY DEFINED TERMS COMPETENCE	1. How they perceive the severity and consequence of the findings. 2. Differences in auditor perception related to severity and consequence 3. Knowledge of the the process is critical and its output BIAS/SUBJECTIVITY BIASED DECISION KNOWLEDGE	1. Auditing knowledge & skills & experience in the discipline being audited. 2. Understanding / familiarity / experience with the criteria being used to rate. 3. Audit preparation , including studying of all scope criteria and documentation. KNOWLEDGE QUALIFICATION AND EXPERIENCE PLANNING	1. Poorly defined rating criteria 2. Knowledge base of the lead auditor 3. Auditor gut feel. POORLY DEFINED CRITERIA KNOWLEDGE BIAS
The audit finding (nonconformity) is rated using a rating criteria. In your opinion, what are the current shortcomings with the current rating criteria?	The current guidelines does not speak to current QA process as well as the nuclear environment NOT QA/QM SPECIFIC NOT NUCLEAR SPECIFIC	The current rating criteria are: - too broad - too high level and not specific enough to QMS type issues. - have not been well defined so as to be understood by either auditor or auditee! NOT SPECIFIC/TOO HIGH LEVEL NOT WELL DEFINED NOT WELL UNDERSTOOD	Open to interpretation which leads to inconsistencies in application. Not linked to risks, and consequence posed by the NC. NOT WELL DEFINED NO LINK TO RISK OR CONSEQUENCE	What are the current rating criteria ... lol! The HML rating of a NC is too limited - do we as QA and the auditee know what the meaning of a medium is? What is the implication of a High? What value, besides being able to rank / group the different ratings together, does the rating process have? NOT WELL DEFINED NO WELL UNDERSTOOD	The current rating criteria was copied from another auditing org which was of a technical nature, hence the the criteria is more technically oriented. QA being QA just adopted without thinking of the implications of this adopted baby growing up. Shortcomings are that it was not developed by us for the nuclear environment e.g Nuclear Safety Culture. NOT QA/QM SPECIFIC NOT NUCLEAR SPECIFIC

Appendix 11: Individual participant's risk identification



Appendix 12: Results of ranking exercise

Item	Participant 1				Participant 2				Participant 3				Participant 4				Participant 5				Participant 6									
	Q	S	P	R	Justification	Q	S	P	R	Justification	Q	S	P	R	Justification	Q	S	P	R	Justification	Q	S	P	R	Justification					
1	1	4	2	3	Impact contractual	2	4	3	1	Housekeeping	3	4	1	2	Regulatory impact	1	4	2	3	Records traceability	4	2	1	3	Licence noncompliance	1	4	3	2	Big financial impact
3	1	2	3	4	Inadequate process	2	3	1	4	Process	1	4	2	3	Configuration and regulatory impact	2	4	1	3	Records control	3	4	1	2	Culture of not learning	1	4	3	2	Not clear
4	1	3	2	4	Implementation inadequacy	1	4	2	3	Attention to detail	3	4	1	2	Less consequence	1	3	2	4	Configuration	4	2	3	1	Quality of records	1	4	3	2	Indexing
5	4	2	1	3	Admin process	4	2	1	3	Control	1	4	2	3	Configuration	3	4	1	2	Impact on plant vs documentation configuration	4	1	3	2	Quality of records	1	4	3	2	Not clear
6	1	2	3	4	Contractual and Configuration issues	3	4	2	1	Configuration	1	4	2	3	Configuration	2	4	1	3	Controls	3	1	2	4	Quality of records	1	3	2	4	Financial impact
7	1	3	2	4	Process inadequate to catch issues	1	4	3	2	Attention to detail	2	3	1	4	Regulatory impact	3	4	2	1	Records control	1	4	2	3	Quality of records	1	4	3	2	Financial impact
8	1	3	2	4	Vague, admn issue	1	2	3	4	Roles and Responsibilities	1	3	2	4	Configuration	2	4	3	1	Project configuration and management	4	2	3	1	Management responsibility	1	4	2	3	Impact on time
9	1	4	2	3	Process implementation failure	1	4	2	3	Lack of evidence	3	2	1	4	Configuration and regulatory impact	3	1	2	4	Records control	4	1	2	3	Licence	1	3	2	4	Acceptance of modification
10	1	3	2	4	Impact on plant, lack of oversight	1	3	4	2	Role clarity	1	4	3	2	Organisation with regulatory impact	1	2	3	4	Interfaces	1	2	3	4	Roles and Responsibility	1	4	3	2	Important process need
11	No data				Process implementation , oversight lacking	3	1	2	4	Nuclear Safety	4	2	1	3	Review of documents	3	1	2	4	Intelligent customer/ Vendor Management	3	1	4	2	Nuclear Safety	1	3	2	4	Financial impact
12	1	3	2	4	Impact on plant, finance, etc	2	3	4	1	Nuclear Safety	1	3	2	4	Review of documents	1	3	4	2	Vendor Management	2	4	3	1	Legal implications	1	4	3	2	Financial impact
13	1	3	2	4	Contract implementation failure	1	3	4	2	Non compliance	1	3	2	4	Configuration	1	3	4	2	Configuration	1	4	2	3	Culture	1	4	3	2	Configuration
14	1	3	4	2	Configuration impact, admin related	1	3	4	2	Configuration	1	4	3	2	Document configuration with less consequence	1	3	4	2	Generation standard non compliance	4	3	2	1	Impact of change magement	1	4	3	2	Process
15	1	2	3	4	Process gap	1	4	3	2	Lack of process	2	4	3	1	No process	1	2	4	3	Interface control	3	2	4	1	Impact of change magement	1	4	3	2	Process
16	1	4	2	3	Vague, admn issue	2	3	4	1	Non compliance	1	4	3	2	Organisational control	2	3	4	1	Generation standard non compliance	4	3	1	2	Risk management	1	4	3	2	Resources
17	1	3	2	4	Process implementation issue	1	3	4	2	Record management	1	4	3	2	Configuration	2	3	4	1	Generation standard non compliance	2	3	1	4	Risk management	1	4	3	2	Resources- People
18	1	4	3	2	Impact on organisation	2	3	4	1	Configuration of process	2	4	3	1	Document review	1	2	4	3	Roles and responsibilities	4	1	2	3	Change management	1	4	3	2	No comment
19	1	2	3	4	Configuration management, out of date issues	2	3	4	1	Configuration of process	1	4	3	2	Organisation configuration	1	3	4	2	Organisational "chaos"/instability	3	1	2	4	Lack of management	1	4	3	2	Impact of recruitment
20	1	4	3	2	Leads to process gaps	2	3	4	1	Configuration of process	1	4	3	2	Interface control	2	1	4	3	Poor understanding of Roles and responsibilities	3	2	4	1	No comment	1	4	3	2	Impact of organisational performance
21	1	4	3	2	Lack of accountability for records	1	4	3	2	Record management	1	4	3	2	Regulatory impact	1	3	4	2	Admin issues	2	3	1	4	Interface control within HR	1	4	3	2	Records exists

Appendix 12: Results of ranking exercise

Item	Participant 1				Participant 2				Participant 3				Participant 4				Participant 5				Participant 6									
	Q	S	P	R	Justification	Q	S	P	R	Justification	Q	S	P	R	Justification	Q	S	P	R	Justification	Q	S	P	R	Justification					
22	4	3	1	2	Process control gap	1	3	2	4	Organisational effectiveness	1	4	3	2	Roles and Responsibility	1	3	4	2	Personnel insecurities	4	1	3	2	Oversight	1	4	3	2	Impact of recruitment
23	1	2	3	4	Admin issue	3	1	2	4	Non compliance to process	1	4	3	2	Less consequence	1	2	4	3	Record control	4	2	3	1	Communication and Safety culture	1	4	3	2	Communication
24	1	2	3	4	Vague, admn related	1	3	2	4	Non compliance to process	1	4	2	3	Less consequence	1	2	4	3	Gut!	1	3	2	4	Lack of Nuclear safety culture	1	4	3	2	Communication
25	1	2	3	4	Procedural anomaly	1	2	3	4	Non compliance to process	1	4	3	2	Less consequence	1	2	4	3	Admin Management control	1	2	4	3	Importance of NC	1	4	3	2	Meetings
26	2	1	3	4	Admin issue	3	2	4	1	Statutory	4	1	3	2	Regulatory impact	3	2	4	1	Statutory	4	2	3	1	Legal	2	1	3	4	Safety
27	4	3	2	1	External evidence- lack of	2	3	4	1	Statutory	4	1	3	2	Regulatory impact	2	3	4	1	Statutory records	2	4	1	3	Legal	2	1	3	4	Statutory Requirement
28	1	2	3	4	Process step breakdown	2	3	4	1	Non compliance to process	4	1	3	2	Regulatory impact	2	3	4	1	Process implementation	3	2	4	1	Process adherence	No data				Statutory Requirement
29	2	4	3	1	External impact	2	3	4	1	Regulatory	2	3	4	1	Regulatory impact	3	2	4	1	Licence violation	3	1	4	2	Legal requirement	2	3	4	1	Regulatory requirement
30	3	1	2	4	Process inadequacy	2	3	4	1	Controls	2	3	4	1	Regulatory impact	3	2	4	1	Licence impact	2	3	1	4	Legal requirement	2	3	4	1	Regulatory requirement (but there are gatekeepers)
31	2	1	3	4	Procedure updating	2	3	4	1	Configuration	1	3	4	2	Regulatory impact	3	1	4	3	Outdated process requirement	4	3	1	2	Leadership/ management	1	4	3	2	Low impact
32	2	1	3	4	Personnel health impact (seriousness)	3	2	4	1	Interface	2	4	3	1	Regulatory impact	3	3	4	1	Future legal implications possible	4	1	2	3	Interface/ Roles and responsibilities	3	2	4	1	Regulatory requirement
33	1	2	4	3	Vague, Which requirement will determine seriousness	2	3	4	1	Statutory	2	3	4	1	Regulatory impact	3	3	4	1	Future legal implications possible	4	3	1	2	Controls	1	3	4	2	Regulatory requirement
34	2	1	3	4	Potential health impact	1	2	4	3	Statutory/ regulatory	2	3	4	1	Regulatory impact	3	3	4	1	Future legal implications possible	3	2	4	1	Licence	1	3	4	2	Regulatory requirement
35	3	1	4	2	Admin update issue	2	3	4	1	Statutory/ regulatory	2	3	4	1	Regulatory impact	1	2	4	3	System update-Admin	1	3	4	2	Licence	1	3	4	2	Impact not clear
36	2	4	1	3	Vague, admin issue	3	4	1	2	Licensing	2	3	1	4	Process nonconformity	3	2	1	4	Proof of activity	2	3	1	4	Licence	2	3	1	4	Impact not clear
37	1	2	3	4	Impact is low	1	4	2	3	Non compliance to process	1	4	2	3	Regulatory impact	2	3	1	4	Records transmission	4	1	3	2	Storage records	1	4	3	2	Record
38	1	2	3	4	Impact of contradictions	1	4	2	3	Configuration	1	3	4	2	Process conflict	1	2	4	3	Interface definition	1	3	2	4	Storage records	1	4	3	2	Process
39	1	3	2	4	Vague	3	4	2	1	Record management	2	3	4	1	Process nonconformity	3	2	1	4	Gut	3	1	4	2	Storage records	1	4	3	2	Potential OTS impact
40	1	3	2	4	Impact on proving activities were performed	1	4	3	2	Record management	1	3	4	2	Less consequence	1	2	4	3	Records control	2	3	4	1	Legal/ retrievability of records	1	4	3	2	Potential OTS impact

Appendix 13: Results of rating exercise

	NC Description	Noted Rating	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11
1	The storage of d	Medium - 2	2	1	3	2	2	2	1	2	2	2	1
2	The lack of an ir	Medium - 2	2	2	2	1	2	2	2	2	2	2	3
3	There is an over	Medium - 2	2	3	2	2	3	2	2	3	2	2	2
4	The level of deta	Medium - 2	2	3	3	2	3	2	1	3	2	2	3
5	There are outsta	Medium - 2	1	3	2	2	2	1	2	3	3	2	3
6	There is a lack of	Medium - 2	2	2	1	2	2	2	2	2	2	3	3
7	Incomplete reco	Medium - 2	1	1	3	2	2	2	1	2	2	3	1
8	The responsibili	Medium - 2	2	3	2	2	2	2	2	2	2	3	2
9	The modificatio	Medium - 2	2	2	2	2	2	2	1	2	2	3	1
10	The roles and re	Medium - 2	2	1	2	1	2	2	2	2	2	2	2
11	The verification	Medium - 2	1	2	1	1	2	1	1	2	2	2	3
12	The review of co	Medium - 2	2	1	1	1	2	2	1	1	3	2	1
13	The contracts fil	Medium - 2	2	2	2	2	3	3	1	2	2	2	2
14	The process for	Low - 3	3	3	2	2	3	1	2	3	3	3	2
15	There is no proc	Low - 3	2	1	2	1	1	2	2	3	2	2	2
16	Anomalies were	Medium - 2	3	3	2	1	2	1	1	2	2	2	2
17	Implementation of	Medium - 2	2	2	3	1	2	1	2	2	2	2	2
18	The documented	Low - 3	3	2	2	2	3	2	2	3	2	2	3
19	Organograms de	Medium - 2	2	2	2	2	3	2	3	2	2	3	3
20	Changes to the	Low - 3	2	2	2	2	2	2	3	2	2	3	3
21	The records for	Medium - 2	2	2	3	2	2	3	3	3	3	3	1
22	There are posit	Medium - 2	2	2	2	2	2	2	2	2	2	3	2
23	Records original	Low - 3	3	3	2	2	3	2	2	3	2	2	1
24	Not all requirem	Medium - 2	3	3	2	2	3	2	1	3	2	3	3
25	The documented	Low - 3	3	3	2	2	3	3	3	3	2	2	3
26	The acceptance	Medium - 2	1	3	1	1	2	1	2	2	2	2	1
27	Records associa	Medium - 2	2	2	1	1	1	1	1	1	1	2	1
28	The KAA-743 pr	Medium - 2	2	2	2	2	2	2	3	2	2	2	1
29	Policies and Pro	High - 1	2	1	1	1	1	1	1	1	1	1	1
30	The current proc	Medium - 2	2	2	2	1	1	1	1	2	2	1	3
31	There were inst	Low - 3	3	3	2	1	2	2	2	3	2	2	3
32	Inadequate inter	High - 1	1	1	2	1	1	1	1	1	2	1	2
33	The identificatio	High - 1	2	3	1	1	2	1	2	1	2	2	1
34	There is inadeq	Medium - 2	1	1	1	1	1	1	1	1	2	1	2
35	The Occupation	Low - 3	2	3	1	1	1	3	1	2	2	1	3
36	Plant surveillan	High - 1	2	3	1	2	2	2	1	3	2	2	2
37	Completed surv	High - 1	2	3	2	2	2	3	2	2	2	2	2
38	Contradictions b	Low - 3	2	3	2	2	2	2	2	3	3	2	3
39	Some of plant st	Medium - 2	2	3	3	2	2	2	2	2	2	2	2
40	Records of outa	Low - 3	2	2	3	2	3	2	1	2	2	2	2

Appendix 14: Results of the second round of the Delphi evaluation

Delphi element	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Q1.1- Significant audit findings can affect audit effectiveness	33.3	50.0	0.0	16.7	0.0
Q1.2- Value-adding report content can affect audit effectiveness	16.7	50.0	33.3	0.0	0.0
Q1.3- Effective resolution of audit findings can affect audit effectiveness	33.3	33.3	0.0	16.7	16.7
Q2.1- Audit team dynamics can affect auditor objectivity	16.7	66.7	16.7	0.0	0.0
Q2.2- Individual auditor bias can affect auditor objectivity	50.0	50.0	0.0	0.0	0.0
Q2.3- QA's organisational position can affect auditor objectivity	33.3	66.7	0.0	0.0	0.0
Q3.1- The reason for rating audit findings is not well understood by auditees	33.3	66.7	0.0	0.0	0.0
Q3.2- Rating audit findings is for QA use only	0.0	0.0	33.3	66.7	0.0
Q3.3- Rating audit findings is an indication of risk	50.0	16.7	16.7	16.7	0.0
Q4.1- Terms used in rating audit findings are not well understood	50.0	50.0	0.0	0.0	0.0
Q4.2- Rating criteria should only consider quality elements	0.0	0.0	33.3	66.7	0.0
Q4.3- Rating criteria should consider elements of safety, reliability and quality	50.0	33.3	16.7	0.0	0.0
Q5.1- A rating methodology will enhance consistency amongst auditors	33.3	50.0	16.7	0.0	0.0
Q5.2- A four level rating score will enhance consistency amongst auditors	0.0	0.0	100.0	0.0	0.0
Q5.3- Variability in rating findings is based on the current skills set of auditors	16.7	33.3	33.3	16.7	0.0