Development of an Auditing Framework by Integrating ISO 9001:2015 Principles within Auditing:

A Case Study of The Great Man-made River Project Authority in Libya

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UP269009

The thesis is submitted in partial fulfillment of the requirements for the award of the degree of Professional Doctorate in Business Administration of the University of Portsmouth, UK

DBA

March 2019
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Abstract: It is reported in the literature that the organizations which implement ISO 9001 quality audit are able to demonstrate the effectiveness of their auditing of conformance, but they may fail to achieve their objectives in terms of their auditing of performance, risk management (RM) and improvement in combination. Most of the previous suggestions to overcome this problem were to: 1) focus on processes in addition to ISO 9001 clauses; 2) apply the principle of ‘Process Approach’ of the ISO 9001 Standard by integration of its risk based thinking concept (RBTC); and 3) apply the approach of Lean Six Sigma (LSS) by integration of its related tools. However, it is revealed that the integration of these approaches within audit also has limitations, such as: 1) the possibility of not auditing the most important things; 2) the desire to foster programs for RM and LSS; and 3) the need to assign auditees and auditors knowing the RM and LSS.

In response to most of these audit limitations, searching for a method that may have the potential to utilize the ISO 9001 Standard in a different way of auditing becomes vital. So, a conceptual audit framework (CAF) was developed, it suggests the selection and integration of twelve management tools (MTs) which are related to the seven quality management principles (QMPs) of the ISO 9001 Standard. Subsequently, a preliminary audit framework (PAF) was developed. It includes the questions and guidelines that are based on the CAF and connected with the complaints, practical needs and results of the review of the previously approved documents of the concerned organization. This PAF was thoroughly tested and validated by a further mixed methods study including eleven internal audits, two management reviews (MR) and three workshops. Also, the ISO 9001 Standard and its related guidelines were reviewed to determine the gap in relation to the enhancement of the audits and its PAF.

Applying this PAF indicated that in order to help organizations to audit their performance, RM and improvement in combination, they need to; 1) change their audit approach from ISO elements to ISO QMPs, 2) integrate the MTs that are related to ISO 9001 QMPs within the phases of audit, 3) perform pre-audits in the form of self-auditing, 4) induce auditors to learn all tools to determine the ideal tools for particular situation, and to attain the skills needed for assertion and sampling, 5) audit each department in combination with its internal customer, 6) involve their auditors in problem solving, risk identification and coaching, 7) Perform MR prior to closing the audit, and 8) develop qualitative metrics to measure the performance of their audits.

Finally, an auditing framework was developed to meet these needs. It includes the PAF’s questions that led to the discovery of major, valid, factual, chronic and systematic audit findings.
Acknowledgements

I wish to express my gratitude to all those who helped make this research possible. First of all, I would like to thank Prof. Ashraf Labib and Dr. Barbara Savage for directing this thesis. Their guidance and support were crucial to the completion of this work. I would also like to thank the participants who believed the importance of this research.
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<td>5Ms</td>
<td>(Manpower, Machine, Method, Measure, Material) Tool</td>
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<td>4Ws, 2Hs, 1C</td>
<td>(What, Where, When, Who, How much, How often and What Consequences) Tool</td>
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<td>Research Purposes</td>
</tr>
<tr>
<td>RQs</td>
<td>Research Questions</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strength, weakness, opportunities and threats Tool</td>
</tr>
<tr>
<td>TAD</td>
<td>Technical Affair Department</td>
</tr>
<tr>
<td>WS</td>
<td>Workshop</td>
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</tbody>
</table>
Declaration

‘Whilst registered as a candidate for the above degree, I have not been registered for any other research award. The results and conclusions embodied in this thesis are the work of the named candidate and have not been submitted for any other academic award’

Word Count: 49,993 (Excluding Table of Contents, Lists of Tables, List of Figures, Abstract, Abbreviations, Diagrams, Appendices and List of References)

Student: Omran Ahmad Abuazza

Date: 13 February 2019

Signature:
Chapter 1: Introduction

1.1 Background

The Great Man-made River Authority [GMRA] in Libya manages and operates Pre-stressed Concrete Cylinder Pipelines [PCCP] as a part of the Great Man-made River Project [GMRP], which has been in operation since 1990. This pipeline carries water from Sahara’s Southern aquifers to the northern urban coastal area and provides 70% of the Libyan population with water. The pipeline consists of approximately 4,000 km of PCCP sized from 1.6 to 4.0 meters diameter and approximately 980 wells producing approximately 5.0 million cubic meters of water per day (Abuazza, Elaish and Nawa, 2007).

Fig. 1.1: The Map of the Great Man-made River Project in Libya. Source: GMRA Investigation Study Report (GMRA, 2002)

“The pipeline of this project was designed to carry water for at least 50 years without problems, but actually it has experienced many failures in 1999, 2000, 2002 and 2003, where a single pipe has failed, together with damage to the pipes adjacent to the failed pipe. These failures cost GMRA more than 150 million US dollars” (Abuazza et al., 2007, P. 1).
As a result, the parties involved in the design, construction and operation of this project indicated that the performance measures tools which were in use at that time were not effective enough for detecting and rectifying any design, manufacturing, installing and operation fault at as early a stage as possible and particularly before the pipeline failure has taken place (GMRA, 2002). The main cause of these failures was determined by GMRA to be the corrosion of steel components embedded in PCCP and the existing monitoring program was not able to detect this corrosion at early stages prior to pipeline collapse. Consequently, a new recovery program has been introduced, established and installed. This program is now in operation.

This program included the application of the following techniques:

- Non Destructive Inspection of Pipeline.
- Corrosion Protection of Pipeline.

The above two techniques are in operation since 2005 and it has been revealed by GMRA (2011) that they were able to detect most corroded areas prior to reaching to the critical point to cause failure. But despite that, GMRA has experienced other types failures in 2012 (GMRA, 2012) and 2013 (GMRA, 2013), which included: collapse of some water pumps of the well field, water leak through valves, header tank settlement and all of these failures caused a lot of damage and loss from technical and economic point of view.

According to the investigation that was carried out by GMRA in 2014, it was concluded that none of the failures were predicted by any of the internal or external audits conducted during that period.

To ensure the efficiency of the monitoring, inspection and corrosion protection techniques of GMRA for identifying any errors or indications of errors at early stages, GMRA has increased the
number of internal audits and made them more frequent and provided its internal auditors with an intensive training program, in order to enable them to perform more effective audits, but in spite of that, similar sudden failures have taken place. These kinds of failures included water leak through butterfly valves, deterioration of pipeline internal lining and failure in feeding pipeline. As a result, it was revealed again by GMRA (2014, P. 5) that “the internal audits were not effective for identifying of many warning indicators and threats. These indicators could not be recognized by any of the auditors. The contents of all audit reports do not communicate information or data that are critical to the integrity of infrastructure”.

1.2 Problem Identification and Rationale

With reference to GMRA, (2014, P. 5), a complaint was raised by GMRA top management related to its internal audits results, identifying that.

“a The internal audits were not effective for determining the new threats, risks and opportunities resulting from the last political change in Libya.

b The audits have failed to identify many warning indicators with regard to technical failure. The contents of all audit reports do not communicate information or data that are critical to the integrity of infrastructure.

c The current internal audits does not bring value, in terms of auditing of performance, risk management and improvement.

d The current internal auditors have failed to make the auditees supporter instead of disbelievers of the audit process.

e GMRA is registered to ISO 9001, ISO 14001 and OHSAS 18001 Standards, but no added value in terms of performance, risk management and improvement was provided.

f Auditors perform audits by sampling, but the number of samples audited are always limited, considering the great size of the project”.

This resulted in nomination of a staff member, who is this author, to start this research study with a recognized university (GMRA, 2014).

Accordingly, the researcher has communicated and agreed with the University of Portsmouth to start this research to identify whether there is a need to develop different methods and
guidelines for ISO 9001 quality auditing and then to develop a novel auditing framework that would get to the bottom of these complaints (from a to f).

These complaints resonate with the tale of “The Blind Men and The Elephant”, which originated in the Indian subcontinent more than 200 years ago. This tale as described by Daigneault (2013) is about six blind men who touch an elephant and give completely different descriptions of what it looks like. Their perceptions vary significantly, describing the elephant as a wall, spear, snake, tree, fan or rope depending on the part of the animal they touched. Therefore, it is suggested by the author of this research study that this metaphor is useful to identify the limitations and weaknesses that are associated with ISO 9001 quality audit.

He (2016, P.29) suggested that in some way, “At the beginning of an audit, an auditor is blind to a certain degree or in a certain area. People who are not blind still make mistakes similar to those in the blind men’s tale, such as taking a one-sided or isolated view of things, or drawing a conclusion based on insufficient information”. As a result, the value of audit may be lost and the reputation of audit damaged and the auditees in these situations may feel troubled by having to be doing some work in reaction to auditors’ findings, even though that they are not convinced. Thus, this conclusion of He (2016) supported the complaints of GMRA top management, who want audits that can provide more valuable information and desire auditors to be providers for quality assurance by taking a more proactive role in suggesting meaningful performance, risk management and improvement.

Also, it is noticed that the complaint number ‘e’ in particular is identical to the limitation that was addressed by Ramly, Ramly and Yusuf (2008, P. 26) who asserted that “many organizations are ISO certified, but audit has been regarded traditionally as added cost activities and fail to improve the organization performance”. They argue that audit should focus toward improving the process performance, product quality, reduction of waste, improve service and cost reduction.

Due to the complaints of GMRA (2014) and conclusions of Ramly et al. (2008) and He (2016), a literature review was undertaken to determine the limitations and problems that are generally associated with ISO 9001 quality auditing and that were determined by other authors (as explained in section 2.3). Thereafter, to propose an auditing framework that has the potential to utilize ISO 9001 standard in a different way of auditing. This way will be explored through utilizing the principles of ISO 9001:2015 within the audits.
Whereas, the development of the framework is the aim of this thesis, and as long as this framework will be based on the ISO 9001 principles and concepts, the topic of performance measurement (PM) methodology of self assessment by using business excellence models (BEMs) will also be enrolled in the literature review of this research study to learn from the experience of their implementers in development of the PM frameworks and in converting the concepts and principles into practice.

1.3 Research Aim

To develop the auditing framework which would assist the organizations that experience difficulties with the current ISO 9001 quality audit to achieve their planned objectives and desired benefits with regard to their auditing of performance, risk management and improvement in combination.

In order to accomplish the research aim, the following specific research objectives were identified.

1.4 Research Objectives (ROs)

1. To identify the limitations of the performance measurement (PM) methodologies by ISO 9001 quality audit and self assessment using BEMs that were experienced by different organizations, as reported in literatures.

2. To determine the audit program strategies that were reported in literatures to overcome these audit limitations.

3. To determine a way of auditing that would enable the organizations to audit the conformance, performance, improvement and risk management collectively and effectively.

4. To determine how the application of the aimed framework might enhance the role of auditor and auditees.

ROs 1 and 2 will be addressed by literature review, and ROs 3 and 4 will be addressed by conducting a mixed methods study including internal audits, management review and workshops.
Prior to realizing these research objectives, the following research questions were identified.

1.5 Research Questions (RQs)

1. Can the ISO 9001:2015 standard be utilized through its principles instead of its clauses to overcome the limitations of ISO quality auditing? And How? This RQ is linked to ROs 1, 3 and 4.

2. Which tools are needed for the auditor to apply the ISO 9001:2015 Quality Management Principles (QMPs) as a model for auditing? How, where and when can these tools be used during audit? This RQ is linked to ROs 2, 3 and 4.

3. To what extent does the integration of these tools help the auditees to conduct an effective self-auditing and help the auditor to enhance the audit’s effectiveness and focus on the most important things? This RQ is linked to RO 4.

4. Can the risk assessment be undertaken during internal audit by use of such tools? And how? This RQ is linked to ROs 3 and 4.

The RQs 1 and 2 will be addressed by conducting a mixed methods study including literature review and practical work by internal audits.

The RQs 3 and 4 will be addressed by analyzing and evaluating the results of the practical work that includes internal audits, management review and workshops.

As a result, the researcher decided to build up his research study based on the rationale and complaints that were described in section 1.2 to ensure that the intended auditing framework will enable the organizations to correct and/or prevent most or all of these complaints, and to find out whether the application of this framework can realize the research objectives and answer the research questions and to what extent?

1.6 Intended Contribution and Audience

Since this research aims to develop a novel auditing framework for the ISO 9001:2015 standard, the intended contributions of this work in terms of theoretical knowledge and practical application will be as follows:
Theoretical
1 A literature review covering the ISO 9001 quality audit limitations and the enhancements that can be undertaken to overcome these limitations.
2 A path model of the relationships between the current audit problems and their impacts on the performance, risk management and improvement of the organization’s processes.
3 The identification of how ISO 9001 quality audit can be improved through a novel application of ISO 9001 quality management principles based on empirical data.
4 Identifying how the QMPs of ISO 9001:2015 can form a more effective basis for the auditing when they are integrated within this audit through their related tools.
5 Determining the cycle of problem definition and solving approach during audit.

Practical
1 Providing organizations with a novel auditing framework that allows them to maximize the desired benefit from their internal auditing.
2 Improving the quality audit by integration and application of the relevant management tools that are connected to the seven QMPs of ISO 9001:2015 severally and collectively.
3 Applying self-auditing may offer better opportunities for the auditees and self-auditors to; improve their processes, focus on the most important matters, and cover wide range of audit evidence.
4 Use of QMPs of ISO 9001:2015 severally or collectively as a model for auditing.
5 Using the aimed auditing framework for guiding the auditee to conduct an effective self-auditing prior to be audited.

The most significant contribution of this research is the development of the auditing framework that would facilitate the integration of ISO 9001:2015 QMPs within audit, and that can be applied by all quality auditors to enhance the effectiveness of their audits (i.e. generic).

In order to achieve these proposed contributions, Fig. 1.3 has been illustrated to show how this research is designed. The chapters of this thesis which describe the various phases of the work are shown in this Figure (Fig. 1.3).
Finding research gaps, research aim, generating research objectives and research questions (Chapter 1).

Creating a path model by development of a novel conceptual auditing framework, which invites for integration of further tools that are related to all of the seven QMPs and three concepts of ISO 9001:2015 severally and collectively (Chapter 2).

Developing and deriving a preliminary auditing framework (PAF) based on the proposed conceptual auditing framework (CAF) and the gap analysis and practical needs of the selected organization (Chapter 5).

Testing the PAF by performing 11 audits at the selected departments (Chapter 5).

Validating the PAF and the results of its audits by conducting two focus group management review meetings and three workshops (Chapter 5).

Determination of the research philosophy, approaches and sampling (Chapter 3).

Determining the methodologies used to tackle the RQs and ROs. It describes the procedure for conducting the audits of this case study and the criteria for categorizing of the audit evidence and audit findings. It explains the methods applied for data collection and analysis (Chapter 4).

Analyzing, validating and evaluating the results of audits and the output of the management reviews and workshops (Chapters 5 and 6).

The introduction: it describes the research background, problems identification, rational as well as the practical needs (Chapter 1).

literature review about the field of performance measurement by self assessment using BEM and ISO 9001 quality audit, their types, limitations and solutions (Chapter 2).

Fig. 1.3: Flow-diagram of the Thesis Structure. Source: The author

Beginning of the procedure that were formulated from LR (output of chapters 2 and 4).

Conclusion (Chapter 7).

End

Revise the proposed PAF and shorten it to be limited to the questions and guides that revealed to discovering of factual / chronic / systematic audit findings in terms of the audit’s pillars of conformance, performance, risk management and improvement (Chapter 6).
1.7 Structure of the Thesis

This thesis is divided into the following chapters for ease of understanding:

1 Chapter 1: The introduction, describes the research background, problems identification, rational as well as the practical needs, research aim, objectives, questions and structure of the thesis.

2 Chapter 2 (Part 1): A literature review on the field of performance measurement by self assessment using Business Excellence Models and ISO 9001 quality audit, their types, and limitations. Additionally, the following previous solutions were covered:

- Auditing performance rather than merely conformance.
- Incorporation of ISO 9001 risk based thinking concept within audit.
- Incorporation of ISO 9001:2015 principle of improvement within auditing.
- Adoption of Self-Auditing.

Chapter 2 (Part 2): Responding to the audit limitations and enhancements by development of the conceptual auditing framework that will be the base of the aimed auditing framework.

3 Chapter 3: Prior to starting the practical work, the research philosophy, paradigm, forms, approaches, reasoning, models and sample are addressed.

4 Chapter 4: Determining the methodologies that will be used to address the research questions and research objectives, which include the methods of data collection and data analysis.

5 Chapter 5 (Part 1): Development and derivation of a preliminary auditing framework (PAF) based on the conceptual auditing framework (CAF) that was established by chapter 2, and the practical needs and results of documentation review that were addressed in section 1.2.
Chapter 5 (Part 2): Testing and validating the preliminary auditing framework by performing; 1) eleven internal audits at the selected GMRA departments, 2) two focus group by management review meetings and 3) three focus group by workshops.

Chapter 6: Analyzing, validating and evaluating the results of the audits of chapter 5, in order to; 1) understand the relationships between the current internal audit problems and their impacts on the QMS performance and then to determine the added value of this research; 2) revise the developed preliminary auditing framework and shorten it to be limited to the questions and guides that led to the discovery of the factual, chronic, systematic audit’s findings in terms of the audit’s pillars of conformance, performance, risk management and improvement.

Chapter 7: The conclusions which discuss the research evaluation, outcomes and contributions. This will be determined by answering the research questions, realizing the research objectives. Then the limitations of this research will be assessed, in order to propose future research.

Since the development of the auditing framework to measure and improve the organizational performance of processes and management system is the main aim of this research, the evolution of performance measurement models will be discussed in sections 2.1 and 2.2. Therefore, it is important to highlight the theoretical knowledge and previous practical application of the previous performance measurement methods.
Chapter 2: Literature Review

2.0 Literature Review on Performance Measurement (PM)

This chapter aims to review the body of knowledge of performance measurement (PM), in order to address the first and second research objectives of this work.

Due to the fact that the PM body of knowledge is of great diversity and that the aim of this thesis is to develop a novel auditing framework, which can help the organizations that experience difficulties with the current ISO 9001 auditing to deliver improved performance measurement, the performance evaluation methodologies by ISO 9001 quality audit and self assessment using BEMs are discussed in this section.

Section 2.1 gives an introduction to the origins and evolution of PM as a body of knowledge and provides some important definitions. Section 2.2 defines the quality-related PM methodologies by use of self assessment using business excellence models and ISO 9001 quality audit, including their types and limitations. Section 2.3 discusses and reviews the previous enhancements that have been reported in literature to overcome the audit limitations of ISO 9001 quality audit. Section 2.4 defines how the researcher responds to the audit limitations and enhancements by development of a conceptual auditing framework (CAF). Section 2.5 defines how the CAF is designed to be the underlying base of the preliminary auditing framework (PAF). Finally, section 2.6 defines the outcomes of this literature review.

2.1 Evolution of Performance Measurement

From an evolutionary style, Neely, Gregory and Platts (1995) as cited by Neely (2004) discussed the performance measurement at early stages, and stated that performance measurement is a topic which is often discussed but rarely defined. They argue that depending on the discipline, PM could have different connotations, such as:

- **Performance Measurement:** “the process of quantifying the efficiency and effectiveness of action” (P. 80).
- **Performance Measure:** “a metric used to quantify the efficiency and/or effectiveness of an action” (P. 80).
- **PM System:** “a set of metrics used to quantify both the efficiency and effectiveness of actions” (P. 81).
Bourne, Neely, Mills and Platts (2003) state that although the Neely et al. (1995) definitions are still valid, the concept of performance measurement has changed and currently refers to a multidimensional set of performance measures for the planning and development of a business. This set includes financial and nonfinancial measures regarding internal and external contexts which are contrasted in current and future scenarios to evaluate and predict an organization’s performance. Moreover, these scholars also conclude that PM cannot be done in isolation because it is only relevant when a correct reference model exists and measures can be compared.

Neely et al. (1995) identified the following PM systems as the most important approaches in the literature:

- The PM matrix developed by Keegan et al. (1989);
- The PM questionnaire created by Dixon et al. (1990);
- CAM-I approach by Computer Aided Manufacturing International;
- Nine-step process by Wisner and Fawcetts;
- Globerson’s guidelines for PM system design;
- Maskel’s seven principles of PM system design; and

In a review of the PM research published in 2005, Neely (2005) found that these models are still the main approaches in the literature and they are used as the basis of new developments. He also argues that the PM research community is very dependent on this limited number of works and the balanced scorecard (BSC) is clearly the single concept that dominates the field. Thereafter, Taticchi, Tonelli and Cagnazzo (2010) published a literature review following Neely’s (2005) work. In their lists of the most cited PM works, Taticchi et al. (2010) include the seven PM systems described above and, they also added the European Foundation for Quality Management’s (EFQM) Excellence Model to the list of Neely et al. (1995). Taticchi et al. (2010) also found that the BSC is the most significant work in the PM body of knowledge.

It is important to highlight that despite the recent attention that the BSC has received in industry, there is not much literature relating the BSC with quality performance applications. In fact, the author of this research was only able to find that the BSC has been used in the performance measurement of the audit process by the following authors:
- Alic and Rusjan (2012), who studied linking the BSC with ISO 9001 internal quality audits.

- The study of Protivi Knowledge leader (2010) as cited by Bota-Avram, Popa and Palfi (2010), who presented data for nine international leading companies, using different metrics for BSC measurement.

- Frigo (2002), as cited by Bota-Avram et al. (2010), who approached the BSC from few key elements perspectives, like the internal audit customers.


The use of BSC in performance measurement of the audit process is discussed in section 2.3.1.7. In addition to the denotation of Taticchi et al. (2010), who added the EFQM to the list of PM systems, Business Excellence Models (BEM) including the EFQM are self assessment frameworks which allow organizations to measure their continuous improvement (Dale, Van Der Wiele and Van Iwaarden, 2007). The categorization of the BEMs, such as the EFQM model as a PM system may be due to the model’s criteria providing a good assessment framework to determine the state of their improvement processes (Dale et al., 2007).

In fact, Dale et al. (2007) argue that the measurement of the progress of improvement on a daily basis and its comparison with scores from previous assessments is a confirmation to the management team that real improvement and achievement have taken place. The quantification of performance in terms of numbers is important for senior management and this is may be why organizations see BEMs as good tools to measure their performance (Dale et al., 2007).

Scholars and practitioners are paying more attention to how organizations can achieve their planned objectives through the measurement of their performance. Karapetrovic and Willborn (2001b) state that two performance evaluation methodologies have received significant attention from managers, they are the quality audit by using ISO standards and self assessment by using BEM. While the quality audit examines the conformance to standards and the suitability of the requirements of these standards to achieve stated objectives, self assessment measures organizational performance against one of the business excellence models (BEMs), for example, Malcolm Baldrige National Quality Award (MBNQA), European Foundation for Quality Management (EFQM) or the Deming Prize.
With reference to the title of this thesis, which is (Development of an Auditing Framework by Integrating ISO 9001:2015 Principles within Auditing) and to RQs 1 and 2, which are related to the concepts and principles of the ISO 9001 Standard, the literature review of this research study will focus only on the quality-related PM models, and in particular the quality audit and BEM.

However, the development and evolvement of self assessment by using BEM are enrolled in this research study because they have already focused attention on the concepts and principles at earlier stages than the ISO 9001:2015 and because of the experience of BEMs implementers in converting the concepts and principles into practice, and in how to provide a framework based on these concepts and principles.

2.2 Quality-related Performance Measurement by Self Assessment by using BEMs and Quality Audits

2.2.1 Models of Quality-related Performance Measurement

In the EFQM (2016), it is stated that in the audit, there is always a criterion which is the standard that explains how the activity should be performed and controlled and the auditor is there to check firstly whether the described process conforms to the standard and secondly whether the process operators are following the described process. In the assessment, the standard is replaced with a set of fundamental concepts. Each model, whether the EFQM Excellence Model, the MBNQA Model, the Deming Prize or other national excellence models, is underpinned by its own specific set of fundamental concepts, which describe desirable outcomes, but not the specifics of how they should be achieved and that is up to the organization to decide. Therefore, the assessors are there to find out why people have chosen to do things the way they do and what other options have been considered; in addition, to see how they measure and monitor these approaches for effectiveness.

With reference to the seven quality management principles (QMPs) of the ISO 9001:2015 Standard and the eight fundamental concepts of the EFQM Excellence Model: 2012, the EFQM (2016) shows that they are analogous and correspond to each other. This means that the recent changes in the ISO 9001:2015 offer good opportunities to use the ISO 9001:2015 Standard in the ways of BEM self assessment.

See Table 2.1, which shows the similarities and differences between them.
<table>
<thead>
<tr>
<th><strong>Principles of ISO 9001:2015</strong></th>
<th><strong>Fundamental Concepts of EFQM</strong></th>
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<tbody>
<tr>
<td><strong>Customer focus:</strong></td>
<td><strong>Adding value for customers:</strong></td>
</tr>
<tr>
<td>The primary focus of quality management is to meet customer requirements and to strive to exceed customer expectations.</td>
<td>Excellent organizations consistently add value for customers by understanding, anticipating and fulfilling needs, expectations and opportunities.</td>
</tr>
<tr>
<td><strong>Leadership:</strong></td>
<td><strong>Leading with visions, inspiration and integrity:</strong></td>
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<tr>
<td>Leadership at all levels establish unity of purpose and create conditions in which people are engaged in achieving objectives.</td>
<td>Excellent organizations have leaders who shape the future and make it happen, acting as role models for its values and ethics.</td>
</tr>
<tr>
<td><strong>Engagement of people:</strong></td>
<td><strong>Succeeding through the talent of people:</strong></td>
</tr>
<tr>
<td>Competent, empowered and engaged people at all levels throughout the organization are essential to enhance the organization’s capability to create and deliver value.</td>
<td>Excellent organizations value their people and create a culture empowerment for the achievement of both organizational and personal goals.</td>
</tr>
<tr>
<td><strong>Relationship management:</strong></td>
<td><strong>Developing organizational capability:</strong></td>
</tr>
<tr>
<td>For sustained success, organizations manage their relationship with relevant interested parties, such as providers.</td>
<td>Excellent organizations enhance their capabilities by effectively managing change within and beyond the organizational boundaries.</td>
</tr>
<tr>
<td><strong>Process approach:</strong></td>
<td><strong>Sustaining outstanding results:</strong></td>
</tr>
<tr>
<td>Consistent and predictable results are achieved more effectively and efficiently when activities are understood and managed as interrelated processes that function as a coherent system.</td>
<td>Excellent organizations achieve sustained outstanding results that meet both the short and long term needs of all their stakeholders, within the context of their operating environment.</td>
</tr>
<tr>
<td><strong>Evidence based decision making:</strong></td>
<td><strong>Managing and agility:</strong></td>
</tr>
<tr>
<td>Decisions based on the analysis and evaluation of data and information are more likely to produce the desired results.</td>
<td>Excellent organizations are widely recognized for their ability to identify and respond effectively and efficiently to opportunities and threats.</td>
</tr>
<tr>
<td><strong>Improvement:</strong></td>
<td><strong>Harnessing creativity and innovation:</strong></td>
</tr>
<tr>
<td>Successful organizations have an ongoing focus on improvement.</td>
<td>Excellent organizations generate increased values and levels of performance through continual improvement and systematic innovation by harnessing the creativity of their stakeholders.</td>
</tr>
<tr>
<td><strong>Creating sustainable future:</strong></td>
<td></td>
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<tr>
<td><em>The remarkable differences are underlined.</em></td>
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Before the issue of the 2015 version of the ISO 9001 Standard, it has already been addressed by the EFQM (2013, p. 3) that “both approaches of ISO 9001 and self assessment by using EFQM are valid and both add value. The difference though is fundamental to the terms used. A “standard” is something everyone should aim to achieve. ‘Excellence’ is defined as exceptional, therefore, if everyone does it, it is no longer ‘excellent’. That is why we see concepts described in excellence models eventually being incorporated into standards over time. The challenge with ‘excellence’ is to always stay steps ahead of the ‘standard’ and drive sustainable performance to the next level”. Thereafter, the key changes in the 2015 version of ISO 9001 are to focus on the concepts and principles of the standard to allow for more efficiency in addressing multiple management system requirements. It focuses much greater on the concepts and principles than the previous versions of 2008 and 2000. The excellence models, such as EFQM have already focused attention on the fundamental concepts of Excellence in the early stages of their development. These concepts define the underlying principles that form the foundation for achieving sustainable excellence in any organization. In order to convert these fundamental concepts into practice, the BEMs, such as the EFQM have provided a framework, which is known in the EFQM as ‘Criteria’.

The recognition by EFQM that the concepts of their excellence model and the principles ISO 9001:2015 are interrelated and they can complement each other, was one of the bases of the idea for developing a conceptual audit framework based on the principles of the ISO 9001:2015 Standard, in addition to the base of converting the concepts into practice.

Since the main similarities between ISO 9001:2015 and EFQM BEM (2012) are between the ISO principles and EFQM concepts, this research study explores whether ISO 9001:2015 can be utilized through its Quality Management Principles (QMPs) in auditing to find out whether they can be used as an audit criterion, instead of its elements. However, and to determine this possibility, it is important to point out the limitations of ISO 9001 quality auditing, in order to identify the actions and enhancements that need to be followed to fill the gaps.

Therefore, the RQ1 was raised to find out whether ISO 9001:2015 Quality Management Principles (QMPs) can be used as a model for auditing instead of its clauses to overcome the limitations of ISO quality auditing.
Accordingly, and before assessing whether the recent changes in the ISO 9001:2015 standard offer good opportunities to be used in the ways of self assessment using BEM, it is important to be familiar with the origins, types, advantages and limitations of these two performance measures, in order to assess whether the enhancements that have been reported in literature are adequate or need to be enhanced.

### 2.2.2 Quality-related PM by Self Assessment using the Most Recognized Business Excellence Models (BEMs)

The frameworks of the self assessment using business excellence models (BEM) allow organizations to measure their continuous improvement (Dale et al., 2007). The most recognized BEM are the Deming Application Prize in Japan, the MBNQA in the United States and the EFQM in Europe. Although there are some differences between these models, they have some common elements and themes. Also, there are many national and regional quality/excellence awards, however, most of them are based on the Deming, MBNQA and EFQM models (Dale et al., 2007).

The use of BEM has two purposes, one is guiding the organization towards Business Excellence (BE) and the other is conducting an assessment of the performance. Adopters may choose one of them and they can adopt any other BEM, but sometimes it is best to use the national model of the organization or the one used by its major customers or suppliers.

Many authors have proposed and developed alternative models to overcome the limitations of the three most well-known BEMs, like Dahlgaard-Park and Dahlgaard (2010) who proposed a new model. This alternative model is named the ‘4P’ excellence model.

#### 2.2.2.1 Quality-related PM by Self Assessment Using Alternative Excellence Model (4P)

This model is shown in Figures 2.1 and 2.2. The ‘4P’ is a precondition for ‘Organizational Excellence’ (OE): 1. People, 2. Partnership/Teams, 3. Processes of work, 4. Products /Services.). The 4P is proposed to be as an alternative and it was found as an attractive BEM for many companies because of the model’s simplicity. This 4P model has only five criteria (Leadership, People, Partnerships, Processes and Products/Services), each of which has a set of potential key performance indicators (KPIs). This model was developed to create a model that provides an
An integrated approach between various and often conflicting aspects such as individual/personal and collective/organizational aspects, as none of the previous BEM can do that. This ‘4P’ model provides a recommended structure and sustainable strategy for achieving innovation excellence, as shown below in Figures 2.2 and 2.3 (Dahlgaard, Pettersen and Dahlgaard-Park, 2011).

Dahlgaard, Chen, Jang, Banegas and Dahlgaard-Park (2013, P. 12) state that “In the journey towards organizational excellence (OE) the weights of each criterion and sub-criterion varies from company to company and from year to year depending on the context”.

Fig. 2.1: The 4P Excellence Model. Source: Dahlgaard-Park and Dahlgaard (2010)

Fig. 2.2: The 4P Excellence Model Flowchart. Source: Dahlgaard-Park and Dahlgaard (2010)
Fig. 2.2 shows that the 4P model is an enabler-result model’ with five criteria where the first four are so called enablers or critical facts for the results (products and services). These four enablers comprise a system of four interrelated components, where the first three may be called the management system, the fourth one (the process component) develops, produces and delivers products and services to the market in accordance with the company’s strategies and plans.

In 2011, many authors, such as Corbett and Angell (2011) and Fisher et al. (2001) as cited by Perini and Tollin (2015) shows that the use of BEM does not always guarantee success. The reason is that there is a wide range of barriers which may explain the difficulty of applying these kinds of models. Among others, some of the main barriers are the lack of top management commitment, limited resources, fear of change, work overload, lack of comprehensive quality improvement education and lack of staff involvement.

The 4P model addressed these problems by providing an integrated approach between various and often conflicting aspects such as individual/personal and collective/organizational aspects, as none of the previous BEM can do that.

Perini and Tollin (2015) pointed out that BEMs should always be flexible so that companies can adopt such models to new needs and challenges. The flexibility of the ‘4P’ model has been tested several times on some whole companies, or a department or a key manufacturing process and in all these applications the challenge was to adapt the ‘4P’ to the actual context, so that relevant results and key performance indicators could be included in the model and later measured by using traditional measurement combined with employees perceived measurement scores collected by using of questionnaires.

The 4P model was developed and proposed to some companies because there are many companies have experienced problems when using the three most well-known BEMs (MBNQA, EFQM and Deming Prize), these problems included various weaknesses, such as too sophisticated assessment criteria, excessive paperwork, weighty procedures and a lack of focus which have limited its use in practice (Dahlgaard et al., 2013).

Nevertheless, it seems that the ‘4P’ excellence model has also some limitations. Dahlgaard et al. (2013) concluded that when implementing the ‘4P’ excellence model like any other excellence model, there will be always a need for management tools (like the tools of the Lean) as well as the right and desirable organizational culture, which has to be identified, defined,
communicated, deployed, practiced, checked/measured by all members in the organization and reflected like any other strategic process initiated by top management, in order to build a total quality culture.

2.2.2.2 Quality-related PM by Self Assessment Using A Business Excellence Framework (BEF)

To respond to some of those problems of BEM and 4P, Dahlgaard et al. (2013) proposed a new overall Business Excellence Framework (BEF). “The suggested overall BEF (Fig. 2.3) helps to integrate BEM with management tools/techniques and the organizational culture/characteristics for guiding an organization towards BE...A document-based empirical case of a world-class company, Boeing Aerospace Support, is being investigated to illustrate how the overall BEF may work in practice as a complement to an existing BEM when companies adapt such models to their specific contexts.” (Dahlgaard et al., 2013, P. 1).

![Business Excellence Framework](image-url)

Fig. 2.3: The proposed Business Excellence Framework “BEF”. Source: Dahlgaard et al. (2013)

Also, the need of the BEM implementers to cultivate its desirable organizational culture has already been suggested by Schein (2010). But the question is what is the most suitable way to cultivate this culture? This author supports the idea that the integration of ISO 9001 principles including the principle number 2 ‘Leadership’ may help because it is fundamentally intertwined with organizational culture.
Therefore, the suggested auditing framework may help to integrate the relevant management tools and cultivate the organizational culture for conducting effective audits by involving the auditors and auditees into every aspect of the audit.

Nevertheless, the question that arises is; once the main topic of this research study is about PM by the ISO 9001 quality audit, what was the purpose of the enrollment of the self assessment using BEMs or BEF here? Before answering this question, the admission of EFQM BEM should be pointed out, because it is cited by EFQM (2016) that the recent changes in the ISO 9001:2015 offers itself good opportunities to be used in the ways of self assessment. But in any way, the intention is not to compare the ISO 9001:2015 with the BEMs (MBNQA. EFQM and Deming) because they have different applications and focuses. On the other hand, both of them (ISO 9001 and BEMs) have some principles and concepts on which they are based and most of these principles and concepts are analogous. Therefore, the answer is; the self assessment by using BEMs were enrolled here to identify the benefits that have emerged from the utilization and integration of their concepts and in order to learn from the experience of leading and world-class companies such as Boeing Aerospace on how to utilize and convert the concepts of the models into a practical framework. For this reason, there was no need to enter into the details of the strengths and successes of the BEMs in this case study.

As a result of the added value that was gained by Boeing Aerospace from its integration of the management tools within the 4P to develop a BEF, it is determined in this case study, whether the ISO 9001:2015 Standard offers itself good opportunities to be used in the ways of self assessment using BEF, by utilizing its principles and whether the integration of these principles through their relevant management tools within auditing helps to overcome the audit limitations? Therefore, the RQ 1 and RQ3 were raised. However, and before answering these two research questions, it is significant to be aware of the problems and limitations that are generally associated with ISO 9001 quality auditing and that are intended to be solved by the aimed auditing framework.
2.2.3 Performance Measurement by Use of ISO 9001 Quality Audit

Russell (2013) pointed out that the audit is an effective measure for identifying any weakness in the management system, identifying opportunities for improvement, verifying the effectiveness and identifying the best practice. Therefore, the PM by audit should include all of these purposes.

In view of ISO 9001:2015, the performance measurement is placed as a sub clause of the main clause of performance evaluation. As a result, the performance measurement is considered as a part of performance evaluation that is consisted of planning, measurement/monitoring, analysis and evaluation.

Hammer (2015, P. 1) reported that the “Performance evaluation has been an important part of ISO 9001 for many years and this importance is highlighted in the new version ISO 9001:2015, by having an entire main clause dedicated to this topic. Performance evaluation is the critical Check step in the Plan-Do-Check-Act (PDCA) concept that ISO 9001 is based on and it is only through this step that you can determine if your quality management system (QMS) is functioning properly, or if changes are needed to meet the requirements”. Therefore, the author of this research believes that the adoption of ISO 9001 standard for developing the audit task, is one of the performance measures that reflect the steps of ‘Check’ and ‘act’, and in order to conduct this audit task effectively and efficiently, it should be controlled by all of these four steps of the PDCA concept.

2.2.3.1 Use of the ISO 9001:2015 Standard as a Model for Auditing

ISO 9001:2015 supports the capability of quality management systems which allows them to be specific to an organization’s processes, products and services. The landscape of today’s quality management systems has changed. “It is not a one size fits all situations” (Aston Technical Consulting Services, 2015). Consequently, it can be argued that the aimed auditing framework would also be subject to change depending on the management tools used for each particular situation.

The justification of selection and preference of the ISO 9001:2015 Standards in lieu of the other Standards is explained in section 3.8.
On the other hand, the limitations, weaknesses and difficulties with the current ISO 9001 quality audit have to be determined (RO 1) in order to determine the actions that are needed to overcome them.

2.2.3.2 The Difficulties with the Current ISO 9001 Quality Audit

Karapetrovic and Willborn (2000) listed many failures detected in ISO 9001 quality audit, which include; 1) the inadequate and improper use of sampling methods when collecting audit evidence, and 2) audit errors remain undetected. Russell (2004, P. 1) identified some common difficulties, which the current ISO 9001 quality audit cannot overcome easily in sustaining ongoing improvement. They include the following.

"- Lack of management commitment.
- Failure to change a culture of shooting the messenger.
- Mindset that conformance to specifications and procedures is sufficient.
- Mindset that quality costs instead of creating wealth.
- Failure to prevent recurrence of problems.
- Failure to find inputs to continually challenge the organization to meet higher competitive standards.
- Failure to involve people in the continual improvement process."

The author of this research advocates that all of these points of Russell (2004) are not related to ISO 9001 Standard but they are related to the current way of auditing.

Wells (2010) argues that audit findings do not generate excitement and urgency in top management because they are typically expressed as non conformance with standards and procedures. He goes on to recommend those audit findings should be expressed in terms of money which is the metric that top management understands and is interested in.

Other audit limitations were stated by Broadleaf (2014), who reported that the audit may not be effective to audit the risk management for organizations which have no documented risk management framework. It is stated in Broadleaf (May 2014, P. 1) that “For many years, audit functions have used information about risk, quite properly, as one of the core inputs to audit planning. For organizations without an effective enterprise risk management (ERM) function, or
one in its early stages of development, this has meant that internal audits have been forced to undertake their own risk assessments: and in many circumstances internal audit have done their own assessments anyway as a check on risk management or to assert their independence. In addition, internal audits also have to audit risk management frameworks, to provide assurance to boards and senior management about their adequacy and effectiveness. This is a requirement of the Institute of Internal Auditors [IIA] Professional Practices Standards”.

He (2016) states that most auditors might not audit the most important matters of the audited process as a result of audit time pressure regardless of the type of audit. He (2016, P. 5) also states that “while an auditor doesn’t have enough time to perform a 100% inspection, sampling is the typical way to conduct the audit. Representativeness is the heart and soul of sampling. Randomness is not always effective and it may mislead the auditor”. However, there is a possibility that the auditor might not audit the most important matters of the audited process because none of the audit standards like ISO 9001:2015, or audit guidelines like ISO 19011:2011 explain the minimum percentage of audit samples to cover. At an earlier date, Karapetrovic and Willborn (2000) identified 16 failures in internal quality auditing, which include; the inadequate and improper use of sampling methods when collecting audit evidence. Hence, the main issue is the proper use of sampling methods and the adequacy of audit evidence rather than the sample size. Despite the fact that the auditors have no time to cover all activities, sub-processes and the interrelated elements of the audited process, it is important for them to ensure auditing of real representations by having the skills needed for assertion, materiality, initial risk assessment and sampling, as explained in sections 2.3.1.4 and 2.3.1.5.

The other audit limitation which was slightly considered in the literature is the obtaining of worthless and insignificant audit findings as a result of auditing the people (auditees) who are unaware to the responsibilities that have been delegated to them by the ISO the 9001:2015 Standard and ISO 19011:2011 Guidelines, which include the following roles:

- “Review and approve any need for changes to the audit plan which may become apparent” (Clause 6.4.4 of ISO 19011).
- “Provide clarification or assisting in collecting information” (Clause 6.4.5 of ISO 19011).
- “When a non-conformity occurs, they shall: 1) review and analyze the non-conformity, 2) determine the causes of the non-conformity, 3) determine if similar non-conformities have occurred” (Clause 6.4.6 of ISO 19011).
conformities exist, or could potentially occur, 4) deal with the consequences and 5) evaluate the need for action to eliminate the causes of the non conformity, in order that it does not recur or occur elsewhere” (Clause 10.2.1 of ISO 9001:2015).

Therefore, the author of this research study believes that the weakness of the auditee team in terms of the above roles may result in the determination of immaterial audit findings and inaccurate causes. This author believes that the Clauses number 5.4.4, 6.3.3, 6.3.37 and Annex A of ISO 19011:2011 Guidelines paid attention to the competency, selection and skills of auditors, but disregarded these concerns with regard to the auditee team, despite the fact that ISO 19011:2011 Guidelines have necessitated the auditees with the responsibilities that need specific competency and skills.

Additionally, it will be helpful for the auditees team to include the people who can provide sufficient explanations about the effect of problems of the audited process on the performance of the receiver and user of the output of this audited process. In other words, the participation of the internal customer of the audited process within the auditee team would be helpful for improving the competency and awareness of auditee team to the effect of their problems.

To the best of this author’s knowledge, it is a strange idea that most auditors audit only the people representing the process being audited and overlook the internal customers of this process; and sometimes they involve these customers within the auditors’ team. This is because most audit firms understand that all members of the audit team should have the role of auditor, even though it is identified in Note 1 Clause number 3.6 of the ISO 19011:2011 Guidelines that “in the case of internal audit, the audit client can also be the auditee”. Accordingly, it can be argued by this author that the internal customer of the audited process can act as a member in the auditees team.

Seeing that most of the audit limitations identified in this section are related to lack of criteria for the audit of performance, improvement and risk management. The Literature Review resulted in the determination of some audit program strategies which can be followed to overcome some of these limitations and sustain continual improvement.

2.3 Overcoming the limitations of ISO 9001 Quality Audit

To respond to some of the audit limitations that were reported in the literature, like the lack of criteria for the audit of performance, improvement and risk management, and to the audit’s
mistakes that were addressed by this researcher, and to have better measure for the performance of the organizational processes, using different approach of audits (ROs 2 and 3), it was necessary to conduct further LR on the solutions and enhancements that have been reported in the literature prior to determining how to overcome these limitations in this research study.

2.3.1 Auditing Performance Rather Than Merely Conformance

2.3.1.1 Performance versus Conformance

Several authors, such as Karapetrovic and Willborn (2001b), Hoyle and Thompson (2004) and Russell (2006) advocated changing the current approach of audits from conformance to performance in order to better assess the performance of the QMS.

Terziovski and Power (2007) consider that the continual problems that organizations face when conducting internal audits and the current top management dissatisfaction regarding audit results make it imperative to improve the internal audit process. In order to make this improvement possible, the ISO 9004:2009 Guidelines recommend auditors to focus on assessing the performance of their QMS processes instead of only looking at compliance with ISO 9001 clauses.

An effective assessment of the performance of the QMS during internal audits would permit organizations to improve their products, services, processes and the QMS itself.

The conversation about quality audits has moved precisely to this area. During the last two decades, researchers have tried to deepen the understanding of the quality audit process by expanding the debate about conformance versus performance auditing and by providing guidelines to improve internal auditing as a whole (Bernardo, Casadesus, Karapetrovic and Heras, 2010).

Wells (2010) provides an example of a global quality dashboard where some metrics are established. Nevertheless, he does not provide any criteria about how to select effective metrics for the dashboard.

According to ASQ Auditing Handbook (Russell 2013), “the performance audit intends to determine the effectiveness”. The effectiveness of the process or system is measured by its capability to accomplish its objectives and in accordance with principle number 4 of ISO 9001:2015 (Process Approach), it is identified that for the organization, “in order to enhance its
overall performance, they need to develop and implement a system contributes to the organization’s effectiveness and efficiency in achieving its intended results”. As a result, auditing of performance is associated with the determination of effectiveness and efficiency which shall be understood correctly.

Effectiveness is defined by ISO 9004:2009 as “level to which planned activities are realized and planned results achieved” and defined by Rosenfeld (2015) as; meeting business objectives and/or customers’ requirements. Efficiency is defined by ISO 9004:2009 as “Ratio between planned results and used resources”. Rosenfeld (2015) has defined the efficiency and effectiveness as; doing the work with fewer resources. Therefore, it was vital to verify the effectiveness and efficiency of the audit process itself to uncover any gaps, risk or possible weakness at any of its components and phases. This mapping resulted in the determination of the following enhancements.

2.3.1.2 Auditing Performance by Applying the Appropriate Type of Audit

The guidelines of ISO 17021 and ISO 19011 divided the audit into three types from the Auditor’s position point of view as follows:

- Internal audit (First party audit).
- External audit (Second party audit).
- External audit (Third party audit).

Russell (2013) divided the audit into three types from its scope point of view as follows:

- Product audit:
  It is an examination of a particular product or service (hardware, processed material, software) to evaluate whether it conforms to requirements (that is, specifications, performance standards and customer requirements).

- Process audit:
  It is a verification that processes are working within established limits. It evaluates an operation or method against predetermined instructions or standards to measure conformance to these standards and the effectiveness of the instructions. Accordingly, the process audit is associated with the effectiveness of the system, and the method of the process audit leads to audit conformance and performance collectively.
- System audit:

It is an audit conducted on a management system. It can be described as a documented activity performed to verify, by examination and evaluation of objective evidence, that applicable elements of the system are appropriate and effective and have been developed, documented and implemented in accordance and in conjunction with specified requirements.

In this research study, each audit will be a combination of system and process audit, in order to verify the effectiveness of the management system (MS), by using the process techniques as the main method of the audit strategy.

Regardless of whether the subject of the audit is a process, or system, the auditor should determine his auditing strategy (audit path) to avoid any risk of gathering inappropriate data (Russell, 2013).

2.3.1.3 Auditing Performance by Applying the Appropriate Audit Strategies/Methods/Techniques

Audit strategy was determined by several authors, such as Kaziliunas (2008) and Russell (2013). Kaziliunas (2008) suggests different approaches for better auditing, but he states that the most effective is the process-based approach where auditors seek to establish the results the organization needs to achieve and examine the way that processes are managed to achieve these results and improve performance. Kaziliunas (2008) provides an explanation about why even if organizations are having problems with their audits, they apply the compliance approach. Kaziliunas (2008, P. 72) argues that “organizations continue with the conformity approach to auditing because certification bodies do the same. Auditors concentrate on what is easy and accessible, spending too much valuable time on details rather than on strategy and [the] larger picture”. Nevertheless, Kaziliunas (2008) does not provide audit criteria about how to conduct the performance assessment of processes in order detect improvements. He shows that the main criteria for conducting both internal and third party quality audits are within the ISO 9001 standard itself. Organizations may include other criteria when conducting internal audits, but the standard identifies the minimum which they must use.

Russell (2013) pointed out that by the Process method audit; the auditor can verify process controls, identify any process risks and define opportunities for improvement conformity.
2.3.1.3.1 Determination and Combination of Multiple Audit Techniques

The method of internal audits would also change from organization to organization and from audit to audit, based on audit’s purpose, scope of work. For example, at GMRA, the audits are divided into external and internal and the internal audits are conducted on the departments regardless whether the audited department covers simple process or complicated processes and whether its implementation of ISO 9001 QMS is partial or complete. Russell (2013) divided the audit strategy into five methods, which include; 1) tracing method, 2) process method, 3) department method, 4) element method, and 5) discovery method (sampling method). The determination of the audit’s method is explicitly identified in Clause 9.2.2.a of ISO 9001:2015, which states “The organization shall plan, establish, implement and maintain an audit program(s) including the frequency, methods, responsibilities, planning requirements and reporting, which shall take into consideration the importance of the processes concerned, changes affecting the organization and the results of previous audits.”. Accordingly, every organization should decide its audit path based on its purpose.

The main audit strategy that is selected to be applied in this research study is the process method and the other methods by tracing, departments and discovery will also be adopted during the stage of audit performing by the Process method. The rationales of this selection are as follows:

- The process method is applied because the ‘Process Approach’ is one of the seven QMPs of the ISO 9001:2015 Standard.
- The tracing method is adopted due to the time limitation of the research audits.
- The discovery method is adopted because it is revealed from the rationale of this research (section 1.2) that the problems exist but have not yet been located and to fill the gap of ISO 9001:2015 related ‘Sampling’.
- The department’s method is applied because the research participants (auditees) represent designated departments.

The process approach method will be the main method that will be applied in the audits of this research study.
2.3.1.3.2 Determination of the Auditing Approach

Auditing process or system by using of process techniques verifies conformance to the required sequential steps from input to output. Process auditors use tools such as simple flowcharts, process maps or process flow-diagrams. The auditors can use these audit tools to ensure all aspects of a process are being audited. Examples of these tools may include the Tree Diagram, and Process Diagram, cited by Russell (2000) and Russell (2006) respectively, as Figures 2.4 and 2.5 show:

For the auditors to use this auditing approach model, they would need to use tools such as the diagrams of Figures 2.4 and 2.5.
Russell (2006) also illustrated in the diagram below (Fig. 2.6) to explain the elements that need to be assessed during process audit.

![Diagram](image_url)

*Fig. 2.6: Process Elements. Source: Russell (2006)*

The above flow-diagrams (Figures 2.4, 2.5 and 2.6) were recommended by Russell (2000, 2006) for the organizations who missed out on the value of process auditing and techniques. Process auditing provides added value by evaluating how process flow, their control and risks and the achievement of the objectives. Due to the possibility of not auditing the most important things of the audited process, it is important for auditor to ensure auditing of real representations by having the skills needed for assertion and materiality.

### 2.3.1.4 Determination of Management Assertion, Materiality and Initial Risk Assessment during the Audit

A management system is the management’s representation of the organization’s operations. For example, if an inventory at one of GMRA audited departments is documented to contain 5,000 units of specific spare parts, the auditor should be able to believe that the inventory actually exists and it has been correctly valuated. These inferred beliefs result from implied representations made by management and are referred to as management assertions.
Assertion is defined by Generally Accepted Auditing Standards (GAAS) as “representations by management, explicit or otherwise, that are embodied in the management system documented information as used by the auditor to consider different types of potential non conformities that may occur”. Relevant Assertion is defined by the same standard (GAAS) as “a documented information assertion that has a reasonable possibility of containing untruthful information that would cause the documented information to be materially misrepresented. The determination of whether an assertion is a relevant assertion is made without regard to the effect of internal controls”. Hence the auditor shall understand the audited organization’s internal control, to identify and assess the risks of material evidence and relevant assertion levels.

In this research study, the researcher starts his work by review of GMRA’s existing documentations which include the procedures and the results of previous internal audits to; 1) ensure understanding GMRA’s internal control, and 2) identify and assess the risks of material evidence and relevant assertion level. As a result, the risk of reaching an incorrect conclusion based upon audit findings will be minimized.

According to the American Institute of Certified Public Accountants (AICPA) / Generally Accepted Auditing Standards (GAAS) / Section 315, A1-A23, “Audit Risk is fundamental to the audit process because auditors do not audit all the documentation of an organizations’ management system. It would be costly to audit all those processes”.

The question is: when the information is judged to be material? According to AICPA GASSA, Section 320, 01-A16, Materiality is; “information is judged to be material if its omission or erroneous statement can influence decisions of the stakeholders based on the statements of the audited organization”. To limit audit risks and to obtain reasonable assurance, the auditor must place the emphasis on the processes and the systems deemed material (synonym: critical).

The materiality level needs to be estimated by the auditors at the following stages:

- Prior to commencing the audit, based on his understanding of the audited organizations’ business and its industry.
- During audit, to adjust their sampling plan based on the materiality of each process and assets.
Auditors measure materiality in the context of significance of a source or process with regard to its effect or impact on the scope of the audit. For example, “a $40,000 inventory lost, undeclared and undetected by the auditor, will be judged non-material for a company that declares ten billion dollars in revenue, but it will be material for a small company that has a one million revenues (PECB, 2016).

Bearing in mind that all of above mentioned materiality and risk assessment are usually performed based on:

- “The organization’s documentation.
- Internal audit reports.
- Risk assessment report.
- Management review report.
- Interview with Management.
- Interview with MS Manager.
- Experience and knowledge of the industry” (PECB 2016, P. 79).

The results of the above documentation review and interviews can be classified as parts of audit methodology and data collection methods, but while the auditor does not have enough time to perform a 100% document review and to cover all contents of audit criteria as the case that was explained in section 1.2, the audit sampling will be an important factor.

Kausek (2008b, P. 3) shows that “Auditors should examine each question on their checklists and ask themselves, ‘How will we verify the auditee’s response? Do we know what to ask for and how we will choose the samples?’ If the answer is not evident, the auditor should develop a verification strategy and add it to the checklist”. Therefore, the method of sampling should be determined and verified.

### 2.3.1.5 Determination of Audit Sampling Methods

Auditors should always choose samples themselves. Kausek (2008b) presented 10 rules that if practiced as he stated, will significantly improve the effectiveness of the audit. One of those rules is; “Never let the auditee pick the samples”. Moreover, it will be helpful for the auditor to prepare a sampling plan based on an initial materiality and risk assessment.
The ABP Consultant (2016) state that the determination of sample size and selection should be based on: complexity, volume, risk, past problems and audit time span. But none of the audit guidelines like the ISO 19011:2011 or standards like the ISO 9001:2015 explain the minimum percentage of samples to cover. To ensure that there is representativeness, an auditor must pay attention to randomness while drawing samples, but He (2016) believed that randomness is not always effective and it may mislead the auditor. However, performing documentation review and particularly record review at early stage (prior to audit) will help the auditor to search, look and hunt the samples almost correctly.

He (2016, P. 31) replied to the new auditor’s question, “How many samples should be drawn and checked? By the answer of: if time allows, the more the better. It is a bad practice for an auditor to check just one sample, fill in the checklist and move on. This practice raises questions such as: If the first sample was good, can the auditor be sure the others also were? If the first sample was bad, how bad was it? Should it be considered a major, minor or isolated mistake? These questions call for additional samples to verify an audit finding before an auditor can form a conclusion”.

The ISO 9001:2015 Standard, ISO 19011:2011 Guidelines and ISO 19011:2018 Guidelines do not describe the method of Sampling during audit, because, in the opinion of this author, the sampling method depends on the judgement, skills and kind of tools used by the auditor, and depends on the types and volume of audited process. As a result, the auditor can adjust his sampling plan based on the materiality of each process and assets (PECB, 2016). By performing assertions management and materiality assessment, the sampling will be much easier, more effective and will lead to proper diagnosis.

In addition, as mentioned earlier, it is not an easy task for any auditor to cover the whole processes and sub processes of any audited department or organization. Hence, it is recommended by the author of this research study for the auditees to audit their processes/departments in advance by the form of self-auditing. The purpose of this self-auditing is; 1) to prepare for the main audit by identifying the issues and deficiencies that should receive the most attention, and then no need for the auditor to waste a lot of time in detecting errors or risks that are commonly known, 2) to help the main auditor to audit and review further samples
and audit evidence, and 3) to help the main auditor to enhance the audits’ effectiveness and focus on the most important things? The main tool of this self-auditing will be the audit criteria.

2.3.1.6 Ensuring Adequacy of Audit Criteria

Clause 3.2 of ISO 19011:2011 Guidelines defines the audit criteria as “the policies, procedures, or requirements used as a reference against which evidence is compared”. Audit criteria are a universal term that describes the reference used by an auditor against which the evidence collected during the audit can be compared. If there are no criteria to compare the audited organization with, the investigation may be called a survey or a review (Russell, 2013).

It is important to highlight that any change in the focus of the audit process would also require an update to the current audit criteria. The main criteria for conducting internal, external and third party audits are within the ISO 9001 Standard itself. Organizations may include other criteria when conducting internal audits, but the standard identifies the minimum which they must use. For the certification bodies (CB), the ISO 9001 standard also provides the mandatory criteria when conducting certification or surveillance audits. Unfortunately, ISO 9001 is insufficient to correctly evaluate the performance of a QMS, due to its lack of clarity and focus in several key clauses and due to the ISO 9001 audit difficulties identified above in section 2.2.3.2. As a result, the main criteria in this research study will be the ISO 9001:2015 principles, rather than its clauses.

Bearing in mind that the audit criteria is different from the criteria of the self-assessment by using the business excellence models.

By comparing the audit criteria with the types and methods of audits, it is noted that the audit method and criteria are interconnected to each other. For example, the specifications used as criteria for the product audit and the laws used as criteria for compliance audit. Therefore, the main audit criterion of this research study will be the Standard of ISO 9001:2015 through its QMPs.

In conclusion of this section (2.3), the characteristics of the audits of this case study are shown in Table 2.2.
### Table 2.2: Characteristics of the audits of this case study. Source: The author

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Implementation Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit Kind</td>
<td>Steppingstone from conformance to performance.</td>
</tr>
<tr>
<td>Audit Criteria</td>
<td>ISO 9001:2015 QMPs.</td>
</tr>
<tr>
<td>Audit Type</td>
<td>A combination of process audit and system audit in the form of internal audit.</td>
</tr>
<tr>
<td>Audit Strategy (methods/Techniques)</td>
<td>The process approach method as a main strategy, with adopting of tracing, departments and discovery methods.</td>
</tr>
<tr>
<td>Audit Sampling Method</td>
<td>Expanding the sample size by: 1- Performing documentation review and determining the complexity, risk and past problems prior to audit. 2- Performing stage 1 audits (self-auditing) prior to the main audits. 3- Never let the auditees pick the samples during the main audit (stage 2 audit).</td>
</tr>
<tr>
<td>Audit Category</td>
<td>Integrated.</td>
</tr>
<tr>
<td>Kind of Integration</td>
<td>Utilizing and integrating management tools/techniques within audit.</td>
</tr>
<tr>
<td>Kind of management tools that will be integrated</td>
<td>The tools/techniques that are related to the principles of ISO 9001:2015.</td>
</tr>
</tbody>
</table>

It is significant to take into account that the internal audit is also a process which needs to be controlled by ISO 9001:2015 concept of PDCA. This means it should be planned, executed, checked and improved. With reference to the enhancements clarified above from section 2.3.1.1 to section 2.3.1.6, it is noted that all of these enhancements are related to the steps of ‘Plan’ and ‘Do’. Therefore, the steps of ‘Check’ and ‘Act’ will also need to be examined in order to verify the effectiveness of this process. The enhancements that are related to the ‘Check’ and ‘Act’ are explained below in sections 2.3.1.7 and 2.3.1.8 respectively.

To enable the organizations to audit the performance of their processes, they would also need to measure the performance of the audit process itself.

#### 2.3.1.7 Performance Measurement (PM) of the Auditing Process

Mihret and Yismaw (2007) identified factors impacting internal audit effectiveness in the Ethiopian public sector, their study found that internal audit effectiveness is strongly influenced by internal audit quality and management support, whereas organizational setting and auditee attributes do not have a strong impact on audit effectiveness.
Bota-Avram and Palfi (2009) argue that despite the fact that internal audit is an integral part of the control framework of an organization, it is obvious that this process must also have its own controls to track whether its performance is consistent with its objectives. Arena and Azzone (2009) attempted to understand the organizational drivers of internal audit effectiveness. Their results indicated that internal audit effectiveness is influenced by many factors such as the characteristics of the auditors and the organizational links. They also provided examples of some indicators that affect internal audit effectiveness such as the ratio between the number of internal auditors and number of employees and the adoption of control risk self assessment techniques.

Le Saux (2010) has created a matrix to link the relationship between audit and metrics of performance. He discusses four possible scenarios of outputs of an internal audit: 1) QMS non compliant and ineffective, 2) QMS compliant but ineffective, 3) QMS noncompliant but effective, and 4) QMS compliant and effective. Then, he argues that a rigorous analysis of audit performance versus QMS processes metrics adds new data to the audit process and allows a repeatable improvement mechanism which leads to enhanced performance. The study of Protivi Knowledge leader (2010) as cited by Bota-Avram, Popa and Palfi (2010, P.145) presented data for nine international leading companies, using different metrics for this measurement. “A synthesis of the main metrics used by international leading companies for measuring and evaluating the performance of internal audit...The first metric was (Using of Balanced Scorecard instrument).”

The Balanced Scorecard model that was pointed out by Frigo (2002) as cited by Bota-Avram et al. (2010, P. 141) is approached from few key elements perspectives like: Internal audit customers. They pointed out that “for the construction of the Balanced Scorecard model presented by Frigo (2002), who starts from the premise that there are some key concepts of this model that could be applied for the internal audit departments like: measuring the performance from customer's point of view”. But the question is: who are their customers? This question has already been answered in section 2.2.3.2 which states that in accordance to clause 3.6 of ISO 19011:2011 the audit client is “the organization or person requesting an audit” and to Note 1 of the same clause which states “In the case of internal audit, the audit client can also be the auditee”. As a result, it is planned in this research study to audit each department of the selected five participants (Department Managers) as an operator of the process and as a
customer for other process. This is explained in Section 3.9.3 of and illustrated in Table 3.2, which shows how each department will participate as an owner of the audited process and as an internal customer for other department that is supposed to be subjected to the subsequent audit. Rupsys and Boguslauskas (2007) provided empirical evidence on measuring internal auditing performance. They argue for the need to measure internal auditing performance using nontraditional measures that expand the current focus on efficiency and effectiveness. Seminogovas and Rupsys (2006) as cited by Zureigat and Al-Moshaigeh (2014) produced a comprehensive model to measure internal audit performance using the Balanced Scorecard Framework, taking into consideration the linkage between internal audit and mission, goals and strategy of the organization. The study argues that such a model will enable the internal audit function to play a significant role in achieving the organizational goals and strategy.

Zureigat and Al-Moshaigeh (2014, P. 80) stated that “The internal audit function is becoming more important due to its role in modern organizations as a strategic tool that is linked to the organizational objectives. This importance increases the need to have a solid framework to assess and measure its performance in order to maintain the effectiveness of the work that internal auditors perform”. Zureigat and Al-Moshaigeh (2014) developed a questionnaire framework based on relevant literature and professional publications and distributed to internal auditors in Saudi Arabian listed companies. The results of their statistical analysis reveal that Saudi listed companies are using both quantitative and qualitative performance measures. Also, internal auditors are considering quantitative measures more important than qualitative measures. At the same time, they found that internal auditors agree that percent of completion against audit plan is the most important quantitative measure.

It was also be noticed by this author that most of the organizations that implement the Balanced Scorecard Model on measuring performance of their internal audits focused on numbers, percentage, ratio and proportions (quantitative), but as the rationale of this research study is qualitative as justified in clause 1.2, the performance measure of the audits of this case study will be based on the qualitative valuableness of their contents.

It is noticed by this author that each organization can develop its own metrics for performance evaluation of its internal audits. For example, Bota-Avram et al. (2010) and Zureigat and Al-Moshaigeh (2014) proposed models, frameworks and/or guidelines aimed at improving the constant problems that organizations have with their internal audits. Therefore, In this research
study, the desirable metrics will be developed during the stage of the management review meeting that is intended to be held to confirm and validate the results of research data collection and interpretation. The result of such validation will be reviewed against the research rationale for the purpose of building up of such evaluation metrics. These metrics will be used to evaluate; 1) the audits of this research study, 2) GMRA internal audits in general, and 3) the aimed auditing framework.

Seeking to make audits more effective, it was important for the organizations and audit firms to complete the PM of their audits by developing different methods to improve their auditing practice. One of those methods was induced to improve the characteristics of the auditors.

2.3.1.8 Auditing Performance by Improving the Auditor’s Characteristics

i. Improvement of Audit Performance by Enhancing of Auditor’s roles

With reference to section 1.2 and in particular to the complaint number ‘d’ of the selected organization, which states that “the current auditors have failed to make the auditees supporter instead of disbelievers of the audit process”, the author of this research study focuses on the types of the added value that were addressed by PwC (2014, P.1) which provides some meanings of this ‘added value’ by explaining the audit operating continuum in the Fig. 2.7.

![Fig. 2.7: Role of Internal Auditors. Source: PwC, (2014, P. 1)](image-url)
This added value was found appropriate to tackle complaint 'd' of section 1.2 because induces the auditees to be involved in the improvement that is expected to be provided from audit, and then to enhance the effectiveness of audit.

Fig. 2.7 represents the added value that is expected to be delivered by internal auditors, whose role include; assurance provider, problem solver, insight generator and trusted advisor. However, the value of “Problem Solver” may conflict with Russell (2013) who asserts that the lead auditors should be careful not to tell the auditees how to complete their work or what decision to make. This preventative measure might have been issued to act in accordance with clause 6.7 of 19011:2011 guideline, which states that “the corrective, preventive or improvement actions are usually decided and undertaken by the auditee”. On the other hand, and from the other point of view, it is addressed in Annex B.8.4 of the same guideline that “depending on the arrangements with the audit client, the auditor may guide the auditee on how to respond to those findings”. Thus, the auditors may need to be aware of Annex B.8.4 of ISO 19011:2011 that implicitly allow them to be involved in solving the problems discovered during audit by finding and removing the causes of these problems. As a result, the author of this research study is involved in the determination of the root causes of audit findings, in order to examine the expected added value of ‘problem solver’, as explained in chapter 6.

With a view to enhance and expand the role of auditor and auditees, the tool of coaching is proposed by this author to be applied and integrated within audit.

ii. Improvement of Audit Performance by Coaching

Coaching, as stated by Anderson (2013) is a useful way of developing people's skills and abilities and of boosting performance. It helps deal with issues before they become major problems. Russell (2013) claims that the lead auditors should have the skills to direct and coach their audit staff (auditor team) and they should be careful not to tell the auditees how to complete their work or what decision to make, as there may be negative impact for the auditees. But the author of this research study disagree with Russell (2013) concerning this restriction, because this author believes that this restriction conflicts with Annex B.8.4 of ISO 19011:2011, that allow the auditor to guide the auditee on how to respond to the audit findings and this restriction may limit the added value roles of the auditor that was aimed by RO 4.
Clause 7.1.6 and Annex A.7 of the ISO 9001:2015 standard 'Organizational Knowledge' encourage organizations “to determine, manage and acquire knowledge in different ways, like mentoring”.

To avoid directing auditees by auditors, this author preferred to apply 'coaching' rather than 'mentoring' because the coach (auditor) can assist and encourage the auditees rather than direct them, and shall not prepare them to give the right or preferred answers. Also, as it is reported by Russell (2004, P. 1) that one of the audit's limitation is (failure to involve people in the continual improvement process), the author of this research suggest that in order to involve the auditees in this improvement, they may need to be coached. Therefore, the purpose of this coaching is not about the incompetency of auditees but it is about the insufficient awareness of auditees to the ISO 9001 and ISO 19011. Accordingly, it will be examined in this research study on how to enhance the role of auditor to include coaching of auditees, in addition to his task as a coach for the team of auditors, as this is a part of RO 4.

Thus, the PAF will be designed in the form of audit questionnaires' checklist and guideline. The checklist will be used as a tool for questions and interviews. The guideline will be used as a tool for coaching the auditees and enable them to prepare for the main audit by auditing their own work in advance (self-auditing).

Since the coaching is a tool, the possibility of its integration within auditing will be determined. But how? This is part of RQ 2.

In order to answer part of RQ 2 which states; [Which tools are needed for the auditor to apply the ISO 9001:2015 QMPs as a model for auditing? How, where and when can these tools be used during audit?] It should be taken into consideration that three of the actions that have been recommended by Principle number 3 of ISO 9001:2015 (Engagement of People) are the “1) facilitating of open discussion and sharing of knowledge and experience, 2) empower people to determine constraints to performance and to take initiatives without fear and 3) recognize and acknowledge people’s contribution, learning and improvement”. This means that the use of coaching tool is implicitly recommended by this principle. That is to say, the integration of this principle means somewhat the integration of the coaching tool. Therefore, the risk of auditing of incompetent and unskilled people with regard to auditing would be minimized by integrating at least one of the tools that are related to this principle, such as ‘coaching’.
In conclusion of all sub-sections of section 2.3.1, it will definitely be noticed that the enhancements that have been identified in all of its sub-sections (from 2.3.1.1 to 2.3.1.8) were related to auditing of performance and they are mostly connected to complaints ‘c, d, e and f’ of section 1.2 ‘Problem Identification and Rationale’. Therefore, it was significant to conduct further literature review on the enhancements that are related to the auditing of risk management and that are needed to respond to the relevant complaints (sub-sections 1.2.a and 1.2.b), which addressed the weakness of their internal audits in identifying of risks, threats and warning indicators with regard to technical failure.

2.3.2  Incorporation of ISO 9001 Risk Based Thinking Concept within Audit

2.3.2.1  Risk Based Thinking Concept (RBTC) within ISO 9001:2015

Freeman and Drown (2015) recommend for the risk to be determined, implemented and effectively assessed prior to be registered and listed. While a formal record of risk analysis is not explicitly called for in the ISO 9001:2015 Standard, auditors may be looking for one and organizations may struggle to understand risk based thinking without it.

The main objectives of ISO 9001 are to provide confidence in the organization’s ability to consistently provide customers with conforming goods and services and to enhance customer satisfaction and the concept of ‘risk’ in the context of ISO 9001 relates to the uncertainty in achieving these objectives (APB Consultant, 2017). Deysher (2015) also focused on this risk concept in the context of the international standards relates to the uncertainty in achieving the organization’s objectives.

The version of ISO 9001:2015 has given risk a more prominent place in the quality management standard. This updated standard requires companies to apply risk based thinking (RBT) to a variety of processes across planning, operations and performance evaluation. But what exactly does ISO mean by risk based thinking? Risk appeared in ISO 9001:2015 standard requirements, which signifies that the risk based thinking concept is embedded in six main clauses of the ISO 9001:2015 standard out of seven clauses.

Deysher (2015, P. 8) identified that “the Risk Based Thinking Concept (RBTC) is embedded in two main principles of ISO 9001:2015 out of seven quality management principles (QMPs). It is an element in the process approach QMP and an element in the improvement QMP”. It should be
taken into consideration that ISO 9001:2015 requirements are based on seven QMPs and consist of seven main clauses. Remembering that RBT was previously known by the preventive action.

From this perspective and as the auditing is a process, the integration of the two ISO 9001 principles of ‘Process Approach’ and ‘Continual Improvement’ within auditing will implicitly mean the integration of their embedded RBTC within this audit process.

Consequently, the use of the latest version of the ISO 9001:2015 Standard as a model for auditing, implicitly means that the auditors are required to implement the RBTC at all phases of their audits.

Sandle (2016) identified that one of the important aspects of the audit process is assessing risk. Risk based internal auditing is a methodology that links internal auditing to an organization’s overall risk management framework. When choosing the areas to audit, selections should not only focus on where the risk is high in terms of outcome, but also consider the degree of confidence in control measures that are applied by the auditee.

Despite that, ISO 9001:2015 does not require any sort of formal risk assessment, nor does it require organizations to maintain a risk register. It centers on incorporating risk into decision making without formalizing exactly how to do it. Risk based thinking is just a watered-down version of risk management (Beavins, 2017). Therefore, the relationship between the RBTC and Risk Management will need to be determined.

2.3.2.2 Risk based Thinking Versus Risk Management

Risk Management can be defined in accordance to Prince 2 (2017) as “the systematic process of proactively managing uncertainties, constraints and assumptions in order to increase the likelihood of meeting our project objectives (e.g. quality, budget and schedule). Two words in this definition draw attention: systematic and proactively. Most project managers deal with risks in a passive manner, i.e., “when the event occurs we will deal with it. Being proactive is the only way to plan for risks and their potential negative impact on the project. As for anything else in Project Management, a systematic process for risk management avoids reinventing the wheel on each project. It also allows for easier transfer of lessons learned from one project to the next”.

Aven, Anderson, Cox, Droguett, Greenberg, Guikema, Kroger, McComas, Renn, Thompson and Zio (2016, P. 14) addressed many key issues for the purpose of determination and management
of risks and they asked, “How can we display risk information without misrepresenting what we know and do not know? Internal audit would be helpful to avoid this misrepresentation. Therefore, the relationship between risk management and audit will need to be determined.

2.3.2.3 Auditing Versus Risk Management

Swanson (2006, P. 5) pointed out that “audits are opportunities for companies to improve, based on auditor analysis and advice. To preserve the integrity and authority of audits, auditors maintain a delicate balance between offering advice and making decisions. According to “the role of internal audit in enterprise-wide risk management ‘ERM’,” by the Institute of Internal Auditors (IIA), the core internal audit role regarding ERM is generally to provide assurance that significant risks are being considered in day-to-day decision making. In providing this assurance, auditors evaluate risk efforts and discuss their findings with management. In addition to evaluating ERM efforts, auditors may also act as champions of ERM by helping managers to identify and evaluate risks, promoting the use of an ERM framework and advising managers on appropriate tactical and strategic risk management response”.

By reporting the ten audit activities that were determined by Swanson (2006), it is revealed that most of them are interrelated with risk management, but they require provision of a risk management program (RMP). On the other hand, how should the auditor behave to cover the activities of risk management if there is no RMP available, as the situation in GMRA? This will be investigated in order to answer RQ 4.

As a result, it will be determined in this research study whether the internal auditors can cover the role of risk assessment during their audits. Consequently, it will be found out how to enable the auditor to be Risk Assessor and then to be involved in risk management as recommended by Swanson (2006). This will be assessed in order to realize part of RO 4. There is also another hint related to RO 4 provided by Holt (2016, P. 5) who looked at what context ISO 9001:2015 places on the management systems auditor and risk management and addressed that “While no specific risk management approach or methodology is prescribed, the organization may want to consider using ISO 31000:2009 Risk management...Moreover, organizations that do not understand their risks and opportunities do not survive”.

Broadleaf (2014) states that “For many years, audit functions have used information about risk quite properly, as one of the core inputs to audit planning. For organizations without an effective enterprise risk management (ERM) function, or one in its early stages of development, this has meant that internal audit has been forced to undertake their own risk assessments: and in many circumstances internal audit has done their own assessments anyway as a check on risk management or to assert their independence. In addition, internal audits also have to audit risk management frameworks, to provide assurance to boards and senior management about their adequacy and effectiveness. This is a requirement of the IIA Professional Practices Standards” (IPPF, 2010, P. 1). Therefore, the extent of risk management that can be undertaken during audit will be investigated in order to answer RQ 4.

As a result, and by reporting of PwC (2014), Broadleaf (2014), Holt (2016) and Sandle (2016), it is determined in this research study, how to integrate the risk assessment within auditing and how to enable the auditor to be a risk assessor and involved in risk management as well in order to answer RQ 4.

Coleman (2015b, P. 2) suggested that “the audit program can be thought of as a performance platform that rests on the three pillars of compliance, improvement and risk management”. Coleman (2015b, P. 10) also divided the risk based quality auditing into the following three levels:

- Level 3: Directly audit the risk management.
- Level 2: Standalone risk management audit of QMS elements.
- Level 1: Incorporate risk management into existing audit”.

In accordance with this classification, the level 1 audit is the one that is intended to be attained by the intended auditing framework which focuses on how to integrate the risk management into the audit program. This way of integration is applied by tying the audit findings’ classification to risk assessment and by categorization of audit findings into non conformity, risk and/or opportunity for improvement.

Saleem and Abideen (2011, p. 261) already addressed that “the identification of risk is one of the processes of risk management, which reveals and determines the possible risk facing up means of organization. It is considered to be the most important step for risk management because it
provides a base for the right future work of the organization...The method chosen for the identification of the risk depends upon the culture and organization’s practices etc.”. Therefore, the level 1 audit, as demonstrated by Coleman (2015b) will be one of the most appropriate methods that can be used to identify the risks.

In conclusion of sections 2.3.1 and 2.3.2, it is definitely noticed that the enhancements that have been explained in these two sections were related to the auditing of performance and risk management respectively and they are connected to most of complaints raised in section 1.2 (a, b, c, d, e and f), with exception of the last one-third of complaint ‘c’ and complaint ‘e’ which are related to the failure of organizations to achieve their objectives in terms of their auditing of improvement.

Therefore, it was significant to conduct further literature review on the enhancements that are related to the auditing of ‘Improvement’ and that are needed to respond to the last one-third of complaints ‘c’ and ‘e’.

Section 2.3.3 shows how these kinds of audit limitations were handled by integration of the tools that are related to Lean Six Sigma approach, which is found to be appropriate and connected with the ISO 9001:2015 principle of ‘Improvement’.

2.3.3 Incorporation of ISO 9001:2015 Principle of ‘Improvement’ within Auditing

Generally, this incorporation is undertaken through utilizing the methodologies that lead the organizations to improve their quality management system (QMS) and enhance their performance. The methodologies of Lean Six Sigma (LSS) were found to be appropriate for this purpose in the following literature.

Soković, Jovanović, Krivokapić and Vujović (2008, P. 7) demonstrated the effectiveness of LSS in general and reported that “Both the Lean and the Six Sigma methodologies have proven over the last decade that dramatic improvements in cost, quality and time can be achieved by focusing on process performance. Most practitioners consider these two methods as complementing each other to achieve world class performance”.

Consequently, Barlow (2013) demonstrated how Lean tools can be integrated into current audit methodology, as the accomplishment of this integration will allow Lean tools to give auditors the ability to drill deeper and wider in looking for weaknesses in business systems, in addition to non conformance to the existing quality management system. Coleman (2015a) then
demonstrated how the Lean and Six Sigma related tools can be integrated into current audit methodology in order to develop more robust, value added and continuous improvement deriving from an internal audit program.

Smoth (2016) also showed that Lean Six Sigma related tools can be utilized to improve audit planning, implementation, corrective and preventive action and follow up activities and he demonstrated that the DMAIC (define, measure, analyze, improve, control processes from 6 sigma) and the PDSA (plan, do, study and act processes from Lean) can be very effective during all the phases of audit. To ensure improving of the audit process itself, the auditors need to ensure they close this PDSA cycle.

Cianfrani and West (2016) recommended the application of self assessment beyond internal audit by applying some of the relevant quality tools and methods such as Lean (minimize waste) and six sigma (minimize errors) as appropriate.

Whereas the above recommendations of Barlow (2013), Coleman (2015a), Cianfrani and West (2016) and Smoth (2016) were mostly about integration of the tools that are related to LSS approaches within auditing and while this helped to manage risk by minimizing waste and errors, it was revealed by Smoth (2016) that the LSS have also some limitations. These limitations include: 1) the need for a significant amount of statistical data gathering and analysis and skilled people and 2) the needs to apply the methodology of LSS and a program for risk management. However, searching for the tools that can be used and integrated without a need for implementing programs for RM and LSS becomes vital.

Accordingly, as long as the improvement is one of the ISO 9001:2015 seven principles and the RBTC is part of this principle, it becomes important and advantageous to find further tools that are related to this principle and to all seven ISO 9001:2015 principles severally or collectively.

Nevertheless, it is remarked by the author of this research study that the solutions that were suggested in sections 2.3.1, 2.3.2 and 2.3.3 may not be directly related to the time limitation and discontinuity of audit. For this reason, searching for a method that may lead to overcome these limitations becomes significant, and then the notion of self-auditing is suggested.
2.3.4 Adoption of Self-Auditing

as long as the auditor might not be able to audit the most important matters of the audited process as a result of audit time pressure, Karapetrovic and Willborn (2002) proposed a model for conducting individual self-audits, where process owners have to conduct continuous self-audits in order to evaluate the performance of their processes. A problem with this approach is that the independence rule of auditing (ISO 19011, Clause 4.d), which states that “auditors should be independent of the activity being audited wherever practical” is not met. Hence, organizations would find it difficult to implement this approach because a non conformity would be identified for violating this independence rule. Therefore, the relevant requirement of ISO 19011 auditor independency will need be reviewed and re-assessed, considering the statement of “wherever practical” that was identified in clause 4.d of ISO 19011:2011.

Taking into account that this independence rule is applicable to the internal audits (first party) and external audits (second party, whereas the ISO 19011 Guidelines are applicable to all of these types of audits. Provided that the management system certification audits follow the requirements of ISO 17021:2011, but “they might also find the guidance of ISO 19011:2011 useful” (ISO 19011:2011, p. v).

This independency rule was also affirmed by Kimotho (2014, P. 145) who concluded that “internal audit independence is crucial to the institution to help to enhance accountability and performance”. One of the bases of this conclusion seems to be the ISO 9001:2008 clause number 8.2.2 which stated explicitly that “the organization must select impartial and objective auditors and the people shall not audit their own work”. Nevertheless, in the sub-clause 9.2.2.c of the latest version of ISO 9001:2015, the statement “not audit their own work” was omitted and the requirement in terms of Independency was changed and revised to be limited to “The organization shall select auditors and conduct audits to ensure objectivity and the impartiality of the audit process”. Therefore, the author of this research study believes that the intent of the independency rule is to ensure the objectivity and impartiality of the auditor and is not to prevent people auditing their own work.

The self-audit shall not preclude the main audit, but it is a preparation for it. Canon (1998) states that before audit can be conducted, standards of performance must be established and implemented within the organization, and the management systems should be in place to reinforce positive conditions identified by the audit.
Therefore, this author advocates that the self-audit can be performed in the form of pre-audit or stage 1 audit because it is more about process performance, understanding and improvement than conformance checking. Then, it helps the auditor (during stage 2 audit) to audit performance rather than merely conformance.

The participation of the internal customer of the audited process with the process owner in self-auditing is recommended by this author to fill the gap of independency, considering that this internal customer is supposed to be the reviewer, receiver and user of the product/service provided by the audited process. Accordingly, when performing self-auditing in this manner, the rules of objectivity and impartiality can be met and the independency rule is not violated. Thereafter, the compliance with these rules can be verified during stage 2 audit.

It should be remembered that one of the actions that have been determined by Principle number 3 of ISO 9001:2015 (Engagement of People) is the “enabling of self-evaluation of performance against personal objectives”. This means that the self-auditing is implicitly acceptable by this principle.

Finally, the author of this study concluded the sub-sections of section 2.3 as in the following:

A While the integration of the LSS approach helped to improve the organizational processes, including the audit process, it can be argued that this improvement can also be attained by integration other tools related to the Principle number 5 of the ISO 9001:2015 Standard, which is termed ‘Improvement’.

b Auditing of risk management is assured by integrating the tools related to the RBTC which is an element in Principle number 5 of the ISO 9001:2015 Standard ‘Improvement.’

c Auditing of performance is assured by integrating the tools related to Principle number 4 of the ISO 9001:2015 Standard ‘Process Approach’.

d Overcoming the audit weaknesses with regard to audit discontinuity is assured by applying self-auditing approach that is consistent with Principle number 3 of the ISO 9001:2015 Standard ‘Engagement of People’.

Consequently, as the audit limitations were minimized by integrating the tools that are related to the ISO 9001 principles of Engagement of People, Process Approach and Improvement, the
idea of integration of further tools that are consistent with ISO 9001:2015 seven QMPs severally or collectively is emerged. However, this can be considered as a reply to RQ 2 (What are the most appropriate tools?) But to answer part 2 of the RQ 2 that states (How, where and when can these tools be used during audit?) it becomes a vital to find out the way of integration that would enable the organizations to select the appropriate tools.

To covert the above four conclusions (a, b, c and d) into practice and to answer RQs 3 and 4, and to respond to the audit limitations and enhancements that have been reported in literature and to the rationale of this thesis (section 1.2), the author of this thesis proposes to utilize and integrate the seven QMPs of the ISO 9001:2015 Standard collectively within the auditing framework that is aimed to be developed.

2.4 Responding to the Current Difficulties of ISO 9001 Quality Audits by Development of an Auditing Framework

As mentioned earlier in section 2.2.1, the ISO 9001:2015 Standard can be utilized through its Quality Management Principles (QMPs). Therefore, it will be justified here how to utilize these principles to form the most important features of the intended auditing framework.

2.4.1 Building the Audit Criteria on ISO 9001:2015 QMPs

West (2003) recommends organizations build the system upon the QMPs of ISO 9001. Amelsberg (2016) found that the QMPs can be used as a foundation to guide an organization’s performance improvement, the relative importance of each principle will vary from one organization to another. Amelsberg (2016) also stated that the QMPs will likely evolve over time to focus more on flexibility, agility, innovation and the big picture of business. He thinks that the world will not speak about quality processes anymore, but about entire quality business principles. ASQ (2016) explained that the QMPs underlying ISO’s quality management standards show how collectively they can form a basis for performance improvement and organizational excellence.

An ISO Publication (2015) provides an explanation of some actions that an organization can take to measure and improve its performance when applying the principles of ISO 9001. Some of these actions are illustrated in Table 2.3.
<table>
<thead>
<tr>
<th>QMPS of ISO 9001:2015</th>
<th>Recommended Actions to be Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Customer Focus</td>
<td>Measure and monitor customer satisfaction.</td>
</tr>
<tr>
<td>2- Leadership</td>
<td>Ensure that the people are provided with the required training and authority that enable them to act with accountability.</td>
</tr>
</tbody>
</table>
| 3- Engagement of People | Enable self-evaluation of performance against personal objectives.  
|                      | Conduct surveys to assess people’s satisfaction, communicate the results and take appropriate actions... |
| 4- Process Approach   | Ensure the necessary information is available to monitor, analyze and evaluate the performance of the overall system. |
| 5- Improvement        | Track, review and audit the planning, implementation, completion and results of improvement projects. |
| 6- Evidence-based decision making | Determine, measure and monitor key indicators to demonstrate the organization’s performance.  
|                      | Analyze and evaluate data and information using suitable methods. |
| 7- Relationship management | Measure performance and provide performance feedback to interested parties, as appropriate, to enhance improvement initiatives. |

Table 2.3: Recommended Actions by ISO 9001 QMPS. Source: ISO Publication (2015)

The nature of the organization and the specific challenges it faces will determine how to implement the ISO 9001:2015 Seven Principles. It is also speculated by ISO Publication (2015) that these QMPS can form a basis for performance evaluation. But the question is: How to utilize these QMPS as a basis for auditing process?

Before answering this question, it is significant to perceive that the actions that have been identified in sections 2.3.1, 2.3.2, 2.3.3 and 2.3.4 are related to three QMPS of ISO 9001 out of seven. These three principles are: Engagement of People, Process Approach and Improvement. Therefore, the idea of utilizing all seven QMPS of ISO 9001:2015 severally or collectively emerged throughout integration of their related tools within the audit, in order to enrich the actions that have already been reported in the literature to overcome the limitations of ISO 9001 quality audit.
2.4.2 Integration of Further Management Tools within Auditing

Since it is demonstrated by many authors such as Coleman (2015a), Cianfrani and West (2016), Barlow (2013) and Smoth (2016) that Lean Six Sigma related tools can be utilized to improve audit planning, implementation and follow up activities and since the integrated tools were related to three principles of ISO 9001 out of seven, the idea of integration of further tools that are consistent with all seven QMPs of ISO 9001:2015 collectively emerged.

In summary, the actions that have been recommended to overcome the limitations of ISO 9001 quality audit are illustrated in Table 2.4.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Implementation Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit Kind</td>
<td>Steppingstone from conformance to performance. Self-auditing is recommended to be performed prior to the main audit.</td>
</tr>
<tr>
<td>Audit Model and Criteria</td>
<td>All seven QMPs of ISO 9001:2015.</td>
</tr>
<tr>
<td>Audit Category</td>
<td>Integrated.</td>
</tr>
</tbody>
</table>
| Pillars of audit               | 1- Audit of compliance (conformance, performance) by applying the process approach model and PDCA concept during audit.  
|                                | 2- Audit of risk management by integrating RBTC within audit.                            |
|                                | 3- Audit of improvement by integrating tools related to improvement principle of ISO 9001. |
|                                | 4- Auditing to overcome the limitations identified in literature by integrating the tools that are related to the principles and concepts of ISO 9001:2015 severally and collectively. |
| Kind of Integration            | Integration of related management tools/techniques within audit.                         |
| Kind of management tools that will be integrated | The tools/techniques that are related to the principles and concepts of ISO 9001:2015 and the tools that can be used amongst different phases of audit (planning, implementation, problems identification, problem solving and closing out). |
| Level of Risk Management in audit | Level 1, which incorporate risk management into existing audit by tying the audit findings’ classification to risk assessment. |

Table 2.4: The Recommended Actions to Overcome the Limitations of ISO 9001 Audit. Source: The author

But the question that arises is: what are the most appropriate management tools that can be integrated within auditing? Before answering this question, it is important to point out that there are many internationally recognized management tools and it is up to each organization to
decide which tool is suitable for its auditing. Auditors should learn all tools to determine the ideal tools for particular situation.

As a result, searching for the management tools/techniques that are connected to the QMPs of ISO 9001:2015 and which can be integrated within auditing becomes significant.

### 2.4.3 Determination of the Most Appropriate Management Tools for Integration within Auditing

Currently, there are significant numbers of management tools available. So, the selection of the most appropriate tool is not always an easy task. It is important to know how, when and which tools should be used in the audit process. Many management authors have tried to define these tools and differentiate between them. Soković et al. (2008, pp. 2-3) suggested that “The tools must meet the main purpose or reason for their application. No single tool is more important in isolation, but could be most significant for a specific application...The quality management principles are a starting point for the company’s management striving for continuous efficiency improvement over a long period of time and customer satisfaction”.

Also, in their analysis of Boeing Aerospace, Dahlgaard et al. (2013) reported that the company not only uses a BEM (like the MBNQA) to guide their operations, but also uses a variety of management tools and techniques in its operation. To determine the most appropriate tools, Dahlgaard et al. (2013) show that the use of BEM for conducting assessment serves basically as the function of ‘check’ in Deming’s Plan Do Check and Act (PDCA) management cycle and to fulfill the whole PDCA cycle, organizations need to incorporate other management tools or techniques for the function of ‘plan’, ‘do’ and ‘act’.

Accordingly, and for the purpose of identifying the most important tools that can be integrated within the auditing framework of this research study, some criteria were developed by this author based on the results of his literature review. The following points are the criteria that were set. These criteria require that the selected tools ought to be:

- related to the seven QMPs of ISO 9001:2015 severally or collectively
- related to the ISO 9001:2015 concepts of PDCA and RBT.
- synergistic to the audit pillars of conformance, performance, improvement and risk management.
- consistent with; 1) the audit limitations that have been reported in the literature,
2) the customer complaints that have been identified in the research rationale (section 1.2), and 3) the results of the documentation review, which include the results of previous internal audits.
- integrated within auditing at its different phases, which include planning, execution, data gathering, data interpretation and closing out.
- learned, understood and handled easily by auditors.
- implemented with no or minimum cost impact.
- used in problem identification, problem solving and analysis of audit evidence and audit findings.
- used without a need for significant amount of statistical data gathering and analysis.
- used without a need for implementing risk management program or lean six sigma program.

This search resulted in the selection of the following twelve tools, as shown in Table 2.5.
<table>
<thead>
<tr>
<th><strong>ISO 9001:2015 Principle</strong></th>
<th><strong>The selected related management tools</strong></th>
<th><strong>Examples of the targeted audit limitations and customer complaints</strong></th>
</tr>
</thead>
</table>
| Customer Focus              | 1-Customer partnership.                  | 1- Obtaining insignificant audit findings as a result of auditing people (auditees) who are incompetent and unskilled with regard to the roles that have been delegated to them by ISO 19011 Guidelines.  
2- Internal customers segmentation. |
|                             | 2- Internal customers segmentation.      | 2- Imperfect recognition/identification of the internal customer of the audited process. |
| Leadership                  | 3-SWOT (Strength, weakness, opportunities and threats).  
4- PEST (Political-Economic and Socio-Technology). |
|                             | 3- Non determination of the threats, risks and opportunities at the audited process.  
4- Failing to identify many warning indicators with regard to technical failures. |
| Engagement of people        | 5-Coaching.                              | 5-Failure to involve people in the continual improvement process.  
6- Limited resources of internal auditors.  
7- Insufficient awareness of the auditee team to the ISO 9001 Standard and ISO 19011 Guidelines. |
| Process approach (including RBTC) | 6- 5Ms (Manpower, Machine, Method, Measure, Material). |
|                             | 8- No added value in terms of performance.  
9- Failing to identify audit findings and their causes correctly and accurately. |
| Improvement (including RBTC) | 7- Problem definitions by 4Ws, 2Hs, 1C (What, Where, When, Who, How much, How often and What Consequences).  
8- Determination of NC Causes by use of 5Ms and 5 whys.  
9- Determination of NC Causes by use of RCA (Root Cause Analysis). |
|                             | 10- Failure to prevent recurrence of problems.  
11- No added value in terms of improvement. |
| Evidence based decision making | 10- PDCA (Plan, Do, Check and What).  
11- Prioritization. |
|                             | 12- Not auditing the most important matters.  
13- Inadequacy of audit samples.  
14- Use of immaterial audit evidence as a base for making decision. |
| Relationship Management     | 12- Value of supplier partnership.       | 15- Limitation of audit time.  
16-Audit discontinuity.  
In addition to the limitations 1 and 2. |

Table 2.5: Selection of the Most Appropriate Management Tools. Source: The author
Table 2.5 shows how the seven QMPs of ISO 9001:2015 can be realized by means of the management tools that are presented in the second column of this table. These selected tools can be used severally or collectively to address at least one limitation for particular situation. For example, the tools of SWOT and Pest were selected to address the principle of 'Leadership' in this situation because this determination should be addressed by the lead auditors in order to ensure auditing of performance and risk management in combination.

Consequently, and to tackle the second part of RQ number 2, Table 2.6 was developed to show at which phase of audit these tools can be integrated.

### 2.5 Development of the Conceptual Auditing Framework

Table 2.6 shows where, when and how these tools are to be used and in a certain sense, it shows how the selected management tools are embedded and dispersed into the phases of the audit.

<table>
<thead>
<tr>
<th>ISO 9001:2015 Principle</th>
<th>Their relevant management tools/techniques</th>
<th>Phases of audit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Execution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schedule, program</td>
</tr>
<tr>
<td>Customer Focus</td>
<td>1-Customer partnership</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>2-Customers segmentation</td>
<td></td>
</tr>
<tr>
<td>Leadership</td>
<td>3-SWOT</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>4-PEST</td>
<td></td>
</tr>
<tr>
<td>Engagement of people</td>
<td>5-Coaching</td>
<td>√</td>
</tr>
<tr>
<td>Process approach</td>
<td>6-5Ms</td>
<td>√</td>
</tr>
<tr>
<td>(includes RBTC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvement</td>
<td>7-Problem definitions by 4Ws, 2Hs, 1C</td>
<td>√</td>
</tr>
<tr>
<td>(includes RBTC)</td>
<td>8-Determination of NC causes by 5whys</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9-Determination of NC causes by RCA</td>
<td></td>
</tr>
<tr>
<td>Evidence based decision</td>
<td>10-PDCA</td>
<td>√</td>
</tr>
<tr>
<td>Management</td>
<td>11-Prioritization</td>
<td></td>
</tr>
<tr>
<td>Relationship Management</td>
<td>12-Value of supplier partnership</td>
<td>√</td>
</tr>
</tbody>
</table>

Table 2.6: The Conceptual Auditing Framework. Source: The author
The twelve management tools that are shown in Tables 2.5 and 2.6 were selected to be applied into the following phases of audit.

- All of the selected tools will be integrated into a preliminary auditing framework (PAF) in the form of questionnaires’ checklist and guidelines. This PAF will be developed based on the foregoing CAF, as it appears in section 5.2 of Chapter 5.

- The tool of problem definition by 4Ws, 2Hs, 1C is selected to be used at the audit phase of determination and categorization of audit findings. The tools of problem solving by RCA and 5Ms were selected to be used at the audit phase of determination of the causes of audit findings.

- The tool of coaching will be applied into the audit phase of ‘Execution’ by allowing the lead auditor to be a coach for the auditee team.

- The tools of customer partnership, internal customer segmentation and value of supplier partnership will be applied into the audit phase of ‘Planning’ to determine the auditee team perfectly and to enable the internal customer of the audited process to participate with the auditees team. Furthermore, these tools will be applied to facilitate performing self-auditing (stage 1 audit) by the auditees at their departments prior to be subjected to the main audit (stage 2 audit) by using the criteria of PAF.

Organizations can use the conceptual auditing framework of the Table2.6 as a base to develop the PAF in accordance to the diagram that is shown in Fig. 2.8.


2.6 The Outcomes of the Literature Review

In response to the audit limitations and the enhancements that were reported in the literature, a CAF was developed, and to show how the researcher responded to the practical needs of the selected organization (GMRA), a PAF will be developed based on the suggested CAF. The approach that has been used to develop the PAF is explained in chapter 5, which also includes the structure this PAF.

This PAF will be thoroughly tested and validated by further mixed methods studies that are determined in Chapters 3 and 4. After completing the practical work, this PAF will be evaluated against the results of data analysis, RQs, ROs, prior to be revised to its final version (see chapters 5, 6 and 7 for more details).

The following chapters (3 and 4) describe the methodology used to address the research objectives and research questions of this research study.
Chapter 3: LR on Research Methods

3.0 Research Design

The aim of this chapter is to describe the research philosophy and research design. Section 3.1 explains the philosophical position underpinning this study. Section 3.2 describes the research paradigm. Section 3.3 classifies the form of this research based on its specific objectives. Section 3.4 explains the research approaches to determine whether this research study is deductive, inductive or hypothetico-deductive. Section 3.5 describes the research design to determine whether this research is qualitative or quantitative. Section 3.6 describes the types of the selected approach to determine the types of this research. Section 3.7 explains the research reasoning to determine the direction of this research study. Section 3.8 explains the justification behind the selection and preference of the ISO 9001:2015 Standards in lieu of other Standards. Finally, section 3.9 justifies the selection of GMRA as the sample of this research study.

3.1 Research philosophy

In developing research, there is always a need to use a particular methodology and methods to characterize the assumptions about reality that the research is incorporating. The relationship between philosophy and social research according to May and Williams (2002, p. 9) is that “the philosophy is concerned to know what kind of things exist in the world and what is our warrant to know them, social research is concerned with their knowable properties. The outcomes of philosophical investigations impact directly on what can be said of social properties”. Saunders, Lewis and Thornhill (2015, P. 24) summarized the research philosophy in the following.

- The term research philosophy relates to the development of knowledge and the nature of that knowledge.
- It contains important assumptions about the way in which researchers view the world.
- There are three major ways of thinking about research philosophy: epistemology, ontology and axiology. Each contain important differences which will influence the way in which you think about the research process”.

Saunders et al. (2015, P. 24) also defined these ways as follows:
I. The first way (Epistemology) “concerns what constitutes acceptable knowledge in a field of study...The main three ways of the epistemology philosophy that influence the way in which the researcher thinks about the research process are: positivism, interpretivism and realism”. The following three views of epistemology were clarified by the same authors.

- “Positivism relates to the philosophical stance of the natural scientist. This entails working with an observable social reality and the end product can be law-like generalizations similar to those in the physical and natural sciences.
- Interpretivism is an epistemology that advocates that it is necessary for the researcher to understand the differences between humans in our role as social actors.
- The essence of realism is that what the senses show the researcher is reality, is the truth: that objects have an existence independent of the human mind.” (Saunders et al., 2015, P. 24).

II. The second way of thinking about research philosophy (Ontological), which has already been defined by the same authors in 2009 (Saunders et al, 2009, p. 110) as “the ontological position deals with the nature of the reality and how the world interacts and is viewed”.

Holden and Lynch, (2004, p. 404) have already determined the two ontological aspects in objectivism and subjectivism and pointed out that “the main difference between these two aspects is that objectivism is mostly linked with the natural sciences more than the social sciences. Nevertheless, some researchers attempt to be objectivist in their research employing scientific methods within the world of social research. However, objectivism has been seen as an inappropriate approach to be adopted in the social sciences”.

Williams (1996, p. 96) addressed that “Subjectivism researchers believe that any phenomenon cannot be isolated from the context, the actors and the researcher as well. Due to the complexity of the social sciences, most social science researchers are subjectivists”. Saunders et al. (2009, p. 111) addressed that Subjectivism describes the view that “the social phenomena are created from the perceptions and consequent actions of social actors”. After six years, Saunders et al. (2015, P. 24) have added the third view of the Ontology philosophy which is the pragmatism, that “it holds that the most important determinant of the research philosophy adopted is the research question.
On the other hand, Crotty (1998) categorized the interpretivism as a part of the ontology, not as a part of the epistemology as categorized by Saunders et al. (2015). Crotty (1998, p. 71) addressed that “the interpretivism has different connotations such as hermeneutics, phenomenology and symbolic interactionism. Symbolic interactionism explores the understanding abroad in culture as the meaningful matrix that guides our lives. It is also the theoretical perspective which originates 'pragmatism’”. This means that in accordance to Crotty’s (1998) classification, Interpretivism connotes and implies Interactionism which implies Pragmatism.

Pragmatism can also be traced to the work of Charles Sanders Pierce, who was looking for a critical philosophy. The philosopher conceptualized pragmatism as a method for reflection having the purpose to render ideas clearly (Crotty, 1998). Creswell (2009) argues that pragmatism arises out of a total of actions, situations and consequences rather than antecedent conditions. It is concerned with applications and solutions to problems. Pragmatist researchers emphasize the research problem and use all the available approaches to understand the problem instead of focusing on methods (Creswell, 2009).

III. The third way of thinking about research philosophy (axiology), which is defined by Saunders et al. (2012) as a branch of philosophy that studies judgments about the value. Li (2016) expressed that axiology is engaged with assessment of the role of researcher’s own value on all stages of the research process. Axiology, as explained by Lee and Lings (2008) refers to the aims of the research. In simple terms, axiology focuses on what does the researcher value in his research, this is important because his values affect how he conducts his research and what does he value in his research findings.

The author of this research study believes that pragmatism and interpretivism are the philosophical stance that is applicable to his research. This research is categorized as Interpretivism from Epistemology point of view and categorized as a Pragmatism from an Ontology point of view.

This research study is based on pragmatism and implies interpretivism because its fundamental focus on the application of practical methods to solve problems. The ISO 9001:2015 QMPs and RBTC represent the source and foundations of the ISO 9001:2015 standard requirements, which represent a practical approach for implementing QMS in organizations to solve their business
and management problems, this study sought to develop an auditing framework that would help the organization to measure and improve its performance.

Also, this research study is categorized Interpretivism because it is necessary for the researcher to understand the differences between people interviewed from the view of audit findings that will be resulted their self-auditing.

The author of this study also believes that axiology is applicable to this research. It is interpretivism-axiology because this researcher is part of what is being researched. It is pragmatism-axiology because the research values play a large role in interpreting results and the researcher is adopting both objective and subjective points of view.

In order to determine how this research should be done and how the results should be interpreted, the group of beliefs that influence this research should be determined, it is known as Research Paradigm.

3.2 Research Paradigm

Paradigm is defined in the Webster Dictionary as “an example or pattern: small, self-contained, simplified examples that we use to illustrate procedures, processes and theoretical points”. Patton (1990) defined the paradigm as “a world view and a way of breaking down the complexity of the real world. Guba (1990, p. 17) defined the paradigm as “an interpretative framework, which is guided by a set of beliefs and feelings about the world and how it should be understood and studied”.

Dill and Romiszowski (1997) summarized the functions of paradigms in the following steps:

- Define how knowledge is extracted.
- Define the types of research questions to be asked and the methodologies to be used in answering these questions.
- Decide what is published and what is not published.
- Structure the world of the academic worker.
- Provide its meaning and its significance.
Bryman (2008, p. 605) provides also a definition for the term of paradigm, which is a “cluster of beliefs and dictates which for scientists in a particular discipline influence what should be studied, how research should be done and how results should be interpreted”. As a result of these definitions of paradigm, the author of this research agrees with Crotty (1998) who addressed that there was no consensus between academics about the concept of Paradigm. It is important to point out that paradigms are incommensurable and are inconsistent with each other because of their divergent assumptions and methods.

The paradigm is divided by McLeod (2008, P. 10) into Reductionism, Holism and Mix of Reductionism and Holism.

Reductionism is outlined by Ostreng (2005) as disintegration of any complicated systems into different parts or easily understandable modules. In other words; the breakdown of the parts of the system helps us finding the properties of its constituents. Jackson (2003) as cited by Venkatapathi (n.d) defined the Reductionism, as “it perceives the system through individual components. It then understands the entire system by studying the properties of an individual components of the system and relating it to the entire system”. Reductionism is defined by McLeod (2008, P. 10) as “the belief that human behavior can be explained by breaking it down into smaller component parts...Reductionists say that the best way to understand why the researcher behave as they do is to look closely at the very simplest parts that make up our system, and use the simplest explanations to understand how they work”.

The other type of Paradigm is Holism. It refers to any approach that emphasizes the whole rather than their constituent parts.

Jackson (2003) as cited by Venkatapathi (n.d) maintains that holism considers the system to be more than just the individual aspects or components but it emphasizes the significance of the components and the relationship between them. It also emphasizes on how these components as a whole bring about the system maintenance.

McLeod (2008, P. 14-15) defined Holism as “the whole is greater than the sum of its parts...Holistic does not simplify the situation, focusing instead on understanding the ‘real-world’. It seeks subjective meaning rather than ‘facts’.”
Based on the foregoing definition of Reductionism and Holism, the author of this research classified his research study as a mix between Reductionism and Holism for the following reasons.

- It is categorized as Reductionism, because the audit phenomena need to be broken down into measurable components like scope, criteria, sampling, plan, implementation, determining the audit evidence and audit findings, reporting and follow up and each stage of these components will be broken into more detailed components. In addition, this classification is justified because the researcher will need to deal with different sources of audit evidences, for example, some of them will be sourced from document review and some other evidence will be sourced from interviews and/or observations.

- It is also categorized as Holism, because the components parts of the audit cannot be examined in isolation to determine how the whole works. All components of audits need to be examined in combination and all of audits results will need to be collected and analyzed in combination. Also, it will be a need to deal with: influence, subjective and judgmental evidences and findings during data analysis.

3.3 Forms of Research

Research is classified by CIRT (2012, pp. 1-2) into four main forms based on their specific purposes, these forms are as follows:

- “Basic Research: It is descriptive in nature and is used to understand and explain a phenomenon. This type of research is often conducted for the sake of increasing and advancing a knowledge base.”

- Applied Research: The purpose of this research is to provide information that can be used and applied in an effort to help people understand and control their environment. It is more prescriptive in nature and seeks to offer potential solutions to problems.

- Evaluation Research: The purpose of evaluation research is to examine the processes and outcomes associated with a particular solution to a problem. The research may be
formative in that it attempts to improve the intervention or solution or it may be summative and attempt to evaluate the effectiveness of solution or program.

- Action Research: This research is often conducted within a program, organization or community and the researchers are involved in gathering data and studying themselves.”

In this research study, the forms of “Applied, Evaluation and Action” were found to be applicable, because in accordance to the classification of Brown (2006), the role of the researcher of this research study includes the following types:

- Detective and Doctor, because he needs to detect problems and look at causes of sympathies (Evaluation Research).

- Developer, because he intends to create something new through development of an existing method (Applied Research and Action Research).

The author of this research believes that all of these forms (Applied, Evaluation and Action) can be combined in the form of Action Research, which is found to be the most applicable one for the following justifications:

- This research study adds to knowledge and perhaps more importantly helps to solve practical problems that confront individuals and organizations. It is very much problem centered research.

- It is an attractive strategy to practitioner researchers who have identified problems within their own organizations. This researcher is a staff member within the organization being studied.

- The research questions come from the analysis of the problems faced by those who work within the organization, with the aim of understanding their problems.

- It leads at the end of this research to the formulation of hypotheses or theory that speculate what actions will be needed to bring about the required improvements in practice. The actions are then implemented and the effects analyzed.
“The Action Research is a research approach which aims at both, taking action and creating knowledge and theory” (Coghlan and Brannick, 2007, as cited by Read (2015, p. 1).

On the other hand, the problems of: lack of impartiality, lack of discipline, confusion with consulting and misuse of paradigm are expected in the action research. However, and in order to minimize or avoid these risks, a scientific rigour would need to be shown by the researcher. Examples of those rigours have been clarified by (Baskerville and Wood Harper, 1996, as cited by Read (2015, P. 2)), which are as follows:

- “Establish an ethical client-system infrastructure.
- Plan data collection carefully.
- Observe iterative stages that formulate theory, plan action, take action and evaluate action.
- Generalization based on theory and learning may be implied.
- Report of the research must disseminate the scientific knowledge achieved by the study”.

Evidence for avoiding or minimizing those risks is explained in the Approved Ethics Application Form (Appendices 7 and 8).

3.4 Research Approaches

The research approach was described by Hyde (2000, p. 83) by referring to the tactics and processes adopted by the researcher to conduct the research. He stated that “there are two approaches in the research methodology: inductive and deductive. In general, the inductive approach is a ‘theory building process’, whereas the deductive approach is a ‘theory testing process’”. Saunders et al. (2009, pp. 124-125) addressed that “in the case of the inductive approach, the researcher starts the research by collecting data and then analyzes it to find or create a theory. On the other hand, in the deductive approach the researcher starts with theories or hypotheses in mind and then the data is collected to test these theories or hypotheses, which may consequently be verified or falsified.”

Buchanan, Boddy and McAlman (1988) as cited Saunders et al. (2015, P. 21) argued that: “the needs, interests and preferences of the researcher are typically overlooked but are central to the
progress of fieldwork”. Saunders et al. (2015, P. 22) go on with Creswell (2009) that “the topic on which there is a wealth of literature from which researcher can define a theoretical framework and a hypothesis lends itself more readily to deduction. With research into a topic that is new, on which there is little existing literature, it may be more appropriate to work inductively by generating data and analyzing and reflecting upon what theoretical themes the data are suggesting”.

There is also a hypothetical-deductive method which was proposed by Dutch Physicist Christian Huygens (1629) as cited by Hakim (2000), who addressed that hypothetico-deductive method starts with hypothesis formulation from generalized principles or theory. This hypothesis is subjected to verification by deduction and comparison with available data. Then, the hypothesis is further tested by series of step by step procedure finally leading to either adoption of rejection of formulated hypothesis.

As a result of the above definitions of the three research approaches, it is believed by the author of this research study that his approach should be categorized as an Inductive, due to the reasons below:

- The researcher will collect historical data and information concerning audited processes and pipeline integrity to understand and learn from the past and develop theory or hypothesis as a result of his data analysis.
- The data will be gathered, analyzed and reflected upon what theoretical themes the data are suggesting.
- The researcher will be building inductively from the data to theory or hypothesis and will create strong data-theory link.
- By attaching the approaches to the different research philosophies, deduction owes more to positivism and induction to interpretivism and as the research philosophy was more close to the interpretivism, the approach will be inductive.
- The researcher will be building a theory or hypothesis from data.

However, in the practical research, the researcher attempted not only to test the theories but also to find out some other clues that might lead to new findings and hence, to an opportunity to build theories. From this point, this researcher uses an inductive approach.
3.5 Research Design

Design Approaches are divided into qualitative and quantitative, depending on the methods applied for data collection and data analysis. The qualitative emphasizes words rather than quantification in data collection and analysis. The research methodology literature differentiates between two types of data collection and data analysis techniques. These two types are quantitative (numbers-focused) and qualitative ‘words-focused’ (Bryman and Bell, 2011).

Cassell, Symon, Buehring and Johnson (2006b, p. 290) addressed that “the qualitative methods have been used in a variety of management fields; not only in the soft areas of organizations but also in the quantitative areas such as finance and accounting”.

“Qualitative research can mean many different things to different people” (Cassell et al., 2006a, p. 161) and in different fields and “there is no one generally accepted definition for the term qualitative research” (Johnson, Buehring, Cassell and Symon, 2007, p. 37). Nevertheless, qualitative research can be defined and described by its features and characteristics.

Yin (2010) described the qualitative research in the following five features:

1. Studying the real lives of participants under real life conditions.
2. Representing the views and perspectives of the participants.
3. Covering the contextual conditions of the participants.
4. Explaining the human social behavior.
5. The use of multiple sources of data.

“The two most common quantitative and qualitative data collection examples are questionnaires and interviews respectively” (Saunders et al., 2009, p. 3). Blumberg, Cooper and Schindler (2008) advocate using qualitative data in exploratory research. Bryman and Bell (2007, pp. 423-424) on the other hand, criticized qualitative research as being: “too subjective, difficult to replicate, problems of generalization and lack of transparency”. Therefore, the qualitative researcher should pay more attention to the disadvantages of this kind of research and should try to eliminate them by evaluating their research.
The research is categorized quantitative when its methods of data collection and data analysis are quantitative. This type of research methods requires quantifiable data involving numerical and statistical explanations. Quantitative research is used to quantify the problem by way of generating numerical data or data that can be transformed into usable statistics. In this research study, the data do not need to be presented in numerical form.

Nevertheless, “qualitative research cannot be defined simply as not quantitative research” (Cassell, Buehring, Symon, and Johnson, 2006a, p. 161).

Mixed design is the best approach if the study requires both quantitative and qualitative designs to address the problem statement and the collected data will need to be presented and analyzed qualitatively and quantitatively. “Qualitative studies can use numbers, counts and even descriptive statistics. Using numbers does not mean the study has to be quantitative or mixed methods.” (CIRT, 2012, P. 5).

Nevertheless, the author of this research study categorizes his research as qualitative as long as its methods of data collection and data analysis are qualitative. The qualitative data collection methods in most researches vary using unstructured or semi-structured techniques. Some common methods include focus groups (like auditing of group at the same time, management review meeting and workshops) and individual interviews (like the audit of each department individually).

The main data collection method in this research study is the auditing. The audits of this research study will be based on semi-structured interview based on the criterion of the preliminary audit framework, because the auditor will allow himself to ask supplementary questions in order to investigate more deeply when possible.

The author of this research study shares the view that differentiates between qualitative data analysis and quantitative data analysis, this view is that with quantitative analysis; it is more likely that the analysis will be conducted when the data collection has been completed. In qualitative data analysis; the analysis can start when data collection begins, which is the case in this research study.
The author of this research advocates that the approach of his research should be classified qualitative, due to the following reasons:

- It emphasizes the contents of audit reports rather than quantifying them into many quantitative indicators.
- It involves describing in detail specific situation using research tools like documentation review, audits, interviews, observations and focus group.
- It is used to gain an understanding of underlying reasons, opinions and motivations.
- It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research.
- It is used to uncover trends in thought and opinions and dive deeper into the problem.
- The data collection methods in this research study vary using unstructured and semi-structured techniques, which include focus groups (group discussions), individual interviews and participation/observations.
- Its sample size is typically small and respondents are selected purposively.

3.6 Types of Qualitative Design Approach

McKenzie (n.d) identified different types of the qualitative design approach and designated these types by inquiry approaches and divided them into: case studies, narrative studies, grounded theory, and phenomenology studies. CIRT (2012, pp. 3, 4, 5) designated them by types of qualitative design approach.

i Case Study and Historical

The intent of this approach is to study and understand a single situation, which could be a process, program, activity etc. Collect a variety of material in a specific and bounded time period (CIRT 2012). Creswell (2009) defined this approach as an in-depth exploration of a program, activity, process, or one or more individuals. It is bounded by time and activity. The researcher collects detailed information using a variety of data collection procedures over a period of time.

Anderson, (1998), Denscombe, (2007) as cited by Assalhi (2015) added to this definition that it aims at uncovering the reasons behind the occurrence of a thing and discriminating the
interrelated factors. The case study type allows the use of more than one data collection method such as documents, interviews and questionnaire.

ii Narrative

It describes the lives of individuals to get meaning from them. Creswell (2009) defined the narrative approach by: Information is re-told or re-storied by researcher into a narrative chronology.

The emphasis in such approach is on the story, typically both what and how is narrated. It is a term that subsumes a group of approaches that in turn rely on the written or spoken words or visual representation of individuals. These approaches typically focus on the lives of individuals as told through their own stories. However, this approach will not be applicable in this research study, because the auditor will need to validate and corroborate all stories of the auditees, who will be asked to support their stories with further documented evidence and/or observation.

iii Grounded Theory

Newman (2012, P. 5) defined this approach by:

- Theory developed during data collection process.
- Theory built from data or grounded in the data.
- Conceptualization and operationalization occur simultaneously with data.
- Collection and preliminary data analysis.
- Open to unexpected.
- Builds theory by making comparisons.
- Ponders questions and looks for similarities and differences”.

iv Phenomenology

Studies a human experience at an experiential level such as understanding what it means for a woman to lose a child. It is about understanding the essence or meaning of the experience (CIRT, 2012).
Marques and McCall, (2005, P. 444) defined this approach as:

- “Obtaining authorities’ verbal descriptions base on their perceptions of a phenomenon.
- Aiming is to find common themes or elements that comprise the phenomenon.
- Discovering and describes the elements (texture) and underlying factors (structure) that comprise the experience of the researched phenomenon.
- Use in-depth interviews”.

According to the viewpoint of Keen (2006), as cited by Halank (2010, p. 79), “case studies are most valuable where a planned change is occurring in a messy real world setting and when it is important to understand why such interventions succeed or fail”.

By reporting to the above mentioned definitions of Anderson (1998), Marques and McCall, (2005), Keen (2006) cited by Halank (2010, p. 79), Creswell (2009), CIRT (2012), McKenzie (n.d) and Assalhi (2015), the inquiry of this research study is categorized to be a case study because:

- It intends to study and understand a single situation, which is about quality audits and performance measures at GMRA.
- It collects a variety of data in specific and bounded time period.
- It collects historical studies concerning audited processes and pipeline integrity to understand and learn from the past.
- The researcher is allowed to use more than one data collection method such as documents review, interviews, questionnaire, observation and analysis.

3.7 Research Reasoning and Inquiry Approach

No theories or hypotheses would apply in inductive studies at the beginning of the research and the researcher is free in terms of altering the direction for the study after the research process had commenced (Bernard, 2011).

Saunders et al. (2015) stressed that inductive approach does not imply disregarding theories when formulating research questions and objectives. This approach aims to generate meanings from the data set collected in order to identify patterns and relationships to build a theory:
however, an inductive approach does not prevent the researcher from using existing theory to formulate the research questions to be explored. Inductive reasoning is based on learning from experience. For example, patterns, resemblances, similarities, differences, regularities, and irregularities are observed in order to reach conclusions (or to generate theory).

### 3.7.1 Phenomenon of Inductive Reasoning

Lodico, Spaulding and Voegtle (2010, P. 10) state that “no hypotheses can be found at the initial stages of the research and the researcher is not sure about the type and nature of the research findings until the study is completed. As it is illustrated in figure below, inductive reasoning is often referred to as a bottom-up approach to knowing, in which the researcher uses observations to build an abstraction or to describe a picture of the phenomenon that is being studied”.

![Fig. 3.1: Phenomenon of Inductive Reasoning, Source: Lodico et al. (2010, P. 10)](image)

### 3.7.2 The Cycle of the Qualitative Inductive Research

As researchers review the data collected, concepts become apparent and then they could be tagged with codes. As more data are collected and as data are re-reviewed, codes can be grouped into concepts and then into categories. These categories may become the basis for new theory or hypothesis (Allan, 2003). Thus, grounded theory is quite different from the traditional model of research, where the researcher chooses an existing theoretical framework and only then collects data to show how the theory does or does not apply to the phenomenon under study. Allan (2003) states that it is likely to begin with the research questions, or even just with the collection of qualitative data.
It is also important for the researcher to determine how meanings are formed through and in culture, and to discover, rather than test variables (Corbin and Strauss, 2008).

“In qualitative research, the researcher may develop theory during the data collection process. The inductive method means that the researchers are building theory from data or ground the theory in the data” (Neuman 2014, p. 177).

Neuman (2014) agreed with Allan (2003) that the grounded theory is a research methodology which operates inductively, in contrast to the hypothetico-deductive approach.

On this case study:

- The traditional model of this research study will be: ISO 9001:2015, in the form of its QMPs.
- There is no grounded theory.
- The intended theory or hypothesis that is intended to be developed will be the auditing framework, which will be developed through the stages that were shown earlier in Fig. 2.8.
- The PAF will be tested and validated by mixed methods study including audits, management review meetings and workshops, in order to agree on its final contents.
- The outcome of this research study, which is the proposed auditing framework might need to be tested deductively or hypothetical-deductively by potential researchers.

Based on the above details, this research study can be categorized as follows:
<table>
<thead>
<tr>
<th>Research Method Elements</th>
<th>Selected for this Research Study</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Philosophy</td>
<td>Pragmatism</td>
<td>It is a Pragmatism from an Ontology point of view because its fundamental focus on the application of practical methods to solve problems. It is pragmatism-axiology because the research values play a large role in interpreting results and the researcher is adopting both objective and subjective points of view.</td>
</tr>
<tr>
<td></td>
<td>Interpretivism</td>
<td>It is an Interpretivism from Epistemology point of view because it is necessary for the researcher to understand the differences between people interviewed. It is interpretivism-axiology because this researcher is part of what is being researched.</td>
</tr>
<tr>
<td>Research Paradigm</td>
<td>Mix of Reductionism and Holism</td>
<td>It is categorized as Reductionism because the audit phenomena need to be broken down into measurable components and the researcher will need to deal with different sources of audit evidences. It is also categorized as Holism because all components of audits will need to be examined in combination.</td>
</tr>
<tr>
<td>Form of Research</td>
<td>Action, Applied and Evaluation Research</td>
<td>It helps to solve practical problems that confront organizations. The role of the researcher includes; Developer, Detective and Doctor. It leads at the end of this research to the formulation of hypotheses or theory that speculate what actions will be needed to bring about the required improvements in practice.</td>
</tr>
<tr>
<td>Research Reasoning</td>
<td>Inductive reasoning</td>
<td>It is based on learning from experience.</td>
</tr>
<tr>
<td>Research Approach</td>
<td>Inductive</td>
<td>The researcher attempted not only to test the theories but also to find out some other clues that might lead to new findings and hence, to an opportunity to build theories.</td>
</tr>
<tr>
<td>Research Design</td>
<td>Qualitative</td>
<td>Its methods of data collection and data analysis are qualitative. The data analysis starts when data collection begins.</td>
</tr>
<tr>
<td>Inquiry Approach</td>
<td>Case Study</td>
<td>It collects a variety of data in specific and bounded time period. It collects historical data and information concerning audited processes and pipeline integrity to understand and learn from the past.</td>
</tr>
<tr>
<td>The traditional Model</td>
<td>ISO 9001:2015 QMPs</td>
<td>The gap that is intended to be covered by this research study is related to limitations and weaknesses of ISO 9001 quality audit. ISO 9001:2015 is the latest and most up to date model for the quality audits, and it accommodates the seven QMPs which represent the main topics of this thesis.</td>
</tr>
<tr>
<td>The theory or hypothesis intended to be developed</td>
<td>Auditing framework</td>
<td>It represents the aim of this research study.</td>
</tr>
</tbody>
</table>

Table 3.1: Summary of Research Design and Approach. Source: The author
However, the researcher has to be aware of the errors that could happen during this journey. Neuman (2014, P.186) summarized some of those errors in these points:

- “Developing a good explanation for any theory (i.e., causal, interpretive, or network) requires avoiding some common logical errors. These errors can enter while starting a study, while collecting and analyzing qualitative data. Such errors can be referred to as false explanations that may deceptively appear to be legitimate on the surface but have serious problems once they are more deeply investigated.

- Another problem that involves a mismatch of units of analysis and imprecise reasoning about evidence is reductionism, also called the fallacy of nonequivalence. This error occurs in an explanation of macro-level events using evidence about specific individuals. It occurs when a person observes a lower or disaggregated unit of analysis but makes statements about the operations of higher or aggregated units. In a way, it is a mirror image of the mismatch error in the ecological fallacy”.

Therefore, the above expected errors will be avoided during the stages of Data Collection and Data Analysis (Chapters 5 and 6) by:

- Adopting the mix of Reductionism and Holism, as explained early in section 3.2.
- Corroboration, verification, validation and evaluation of audit evidences and audit findings.
- Applying qualitative analysis of data by themes and coding.
- Validation and evaluation of the results of data analysis by applying recognized evaluation criteria, such as Platts (1993).

Also, it is significant for the researcher to ensure to complete the cycle of the research, which include the elements described below. Newman (2012) summarized the qualitative research cycles as follows:

- “Capture and discover meaning once the researcher becomes immersed in data.
- Concepts are in the form of themes, motifs, generalization, sand taxonomies.
- Measures are created in an ad hoc manner and are often specific to the individual setting or researcher."
- Data are in the form of words from document, observations and transcripts.
- Theory can be causal or non-causal and is often inductive
- Research procedures are particular and replication is very rare
- Analysis proceeds by extracting themes or generalizations from evidence and organizing data to present a coherent, consistent picture”.

Hence, it will be ensured during the stage of data collection and data analysis (Chapters 5 and 6) to follow the steps of the above cycle, as applicable.

As a result, and by taking into account, the complaints and practical needs that were described in section 1.2, the ISO 9001:2015 standard was selected to be the traditional model of this research study and it is favored in lieu of other standards due to the following reasons.

3.8 Reasons of Selection and Preference of the ISO 9001:2015 Standards in Lieu of Other Standards

On account of the reasons mentioned below, the ISO 9001:2015 Standard through its QMPs was selected to be the main criteria and traditional model of the audits of this research study:

a The gap that is intended to be covered by this research study is related to limitations and weaknesses of ISO 9001 quality audit.

b ISO 9001:2015 is the latest and most up to date standard for the quality audits (issued at the end of 2015).

c The sample covered by this case study (GMRA) has already established its quality management system based on this standard and has already been certified to it.

d It accommodates the seven QMPs which represent the main topics of this thesis.

The possibility of selection of inappropriate research sample has to be avoided by taking into account the following strategy.
3.9 Population and Sampling (Research Sample)

Neuman (2014, P. 247) defined the population as “the abstract idea of a large group of many cases from which a researcher draws a sample and to which results from a sample are generalized”. Djebarni, Barnett and Richards (2014) described the population, as the specific group to which the researcher wishes generalize his findings and from which he draws the sample. The population could be individuals or organizations. The population is determined by the research question.

The Sample is defined by Djebarni et al. (2014, P. 246) as “a small set of cases a researcher selects from a large pool and generalizes to the population”. Neuman (2014, P. 247) pointed out that “the possible mistake of choosing a type of sample inappropriate for a study’s purpose has to be avoided by placing of a sampling strategy that matches the specific study’s purpose and data”.

The sample is made up of the elements selected from the sampling frame for inclusion in the research study. There are numbers of sampling techniques (random and nonrandom) that can be employed to select the sample. Djebarni et al. (2014) divided the samples into two types: probability and non probability.

3.9.1 Probability Sampling

Probability samples are those in which every element has a known chance of being selected that is greater than zero and for which selection occurs randomly. It is not necessary for each element to have the same chance of being selected, only that there is some chance in being selected and that chance is known.

3.9.2 Non Probability Sampling

It is the sampling that does not make use of random selection of elements. It is used when the researcher does not have a sampling frame for the population in which he is interested, or where it is felt that a random selection approach is unnecessary.
The most common techniques for selecting non probability samples are as follows:

- Convenience (accidental) sampling;
- Self-selection sampling;
- Purposive sampling;
- Quota sampling;
- Theoretical (expert) sampling;
- Snowball sampling.

Neuman (2014, P. 278) identified eight types of the non probability sampling, which are as follows:

“1 Adaptive: Get a few cases using knowledge of likely locations of a hidden population, use random techniques or recruit and then use a snowball sample to expand from a few cases.

2 Convenience: Get any cases in any manner that is convenient.

3 Deviant case: Get cases that substantially differ from the dominant pattern (a special type of purposive sample).

4 Purposive: Get all possible cases that fit particular criteria using various methods.

5 Quota: Using haphazard methods, get a preset number of cases in each of several predetermined categories that will reflect the diversity of the population.

6 Sequential: Get cases until there is no additional information or new characteristics (often used with other sampling methods).

7 Snowball: Get cases using referrals from one or a few cases, then referrals from those cases and so forth.

8 Theoretical: Get cases that will help reveal features that are theoretically important about a particular setting/topic.”

With reference to the above definitions, the sample selected in this research study is purposive, theoretical and snowball non probability sample, which represent the individuals who are in the best position to help the researcher to answer the research questions. Each participant will be audited as an internal customer of the other participant, in addition to auditing him as a process owner of his process. Therefore, the population in this research study will be as follows:
3.9.3 Population and Sampling in this Research Study

The organization that has been selected in this research study represents the organizations which implement the ISO 9001 standard to conduct their quality audit and represent the organizations that may fail to achieve their objectives in terms of their auditing of performance, risk management and improvement collectively.

Due to the technical needs that were determined in section 1.2, the researcher has selected the Great Man-made River Project Authority In Libya (GMRA) to be the sample that represents this population.

GMRA organization will be represented by the five departments that cover the main and core business processes. These departments are responsible for the processes and component of this case study which includes the measurement, monitoring, evaluation, risk management and project integrity and organizational sustainability. These departments are located at the headquarters and have all records and data of the organization. The departments are; 1) Corrosion Protection Department, 2) Pipeline Non Destructive Inspection Techniques Department, 3) Technical Affairs Department, 4) Operation and Maintenance Department, and 5) Safety Department. These five departments are out of a total of 12 departments which form the whole organization structure. The names of these departments were correctly and accurately translated from Arabic.

The selected five departments will be represented by their managers, who are supposed to be fully aware of the details, problems and threats of their departments and who can get the necessary support from their staff easily. Also, these five department managers were chosen because they comprise the most important departments who form the members of the emergency committee and who are fully responsible for organization management and operation during emergencies and crises.

These managers will be the main participants of this research and they will act as the auditees and respondents. At this stage, no other departments will be audited, as the researcher looks for the data and information of the chosen departments. If any of the manager or his deputy cannot be found at the chosen department, the researcher will go to the Chairman who will be responsible to nominate a certain person from that department to be the acting manager in accordance to the Organization’s Authority Matrix. In this matrix, it is defined who should
Deputize for who (only one chain and it is mentioned that if the deputy is also out, it is the responsibility of chairman to issue an Authority of Delegation to nominate the acting manager at such case and it will be ensured by the researcher that the acting manager is working in the same department and he is already aware of all details of the audited process). Thereafter, additional participants will be approached to validate the results of audit; these participants are the manager of other departments, who will be invited to attend the focus group by the management review meetings and workshop.

To verify selecting the right participants, it is assured that each participant of the selected five samples represents a customer for another participant and a supplier for other. This was also one of the recommendations of Malsbury (1999), who identified some of the initial mistakes that many auditors make and identified the following enhancements:

i. **Recognize the Audit Customers Perfectly / Know What is Important to Them**

Some auditors work by identifying their customers in the top management, but this author believes that the right thing is that the customer is the receiver and user of the output of the audited process, who needs to believe in validity of audit results and who need to correct identified problems.

ii. **Who should be in the auditee team?**

As stated early in section 2.3.4, most auditors audit only the people who represent the process being audited, but based on the opinion of this author, the auditees team should be expanded to include one more auditees, who will be the internal customer of the process being audited.

The samples of participants are illustrated as follows:

<table>
<thead>
<tr>
<th>Department 1</th>
<th>Department 2</th>
<th>Department 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(It is a supplier for Department 2)</td>
<td>(It is a customer for Department 1 and a supplier for Department 3)</td>
<td>(It is a customer for Department 2 and a supplier for Departments 4 and 5)</td>
</tr>
<tr>
<td>Pipeline Inspection Techniques</td>
<td>Corrosion Protection</td>
<td>Operation and Maintenance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Department 4</th>
<th>Department 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(It is a supplier and a customer for Departments 1, 2 and 3)</td>
<td>(It is a supplier and a customer for Departments 1, 2 and 3)</td>
</tr>
<tr>
<td>Technical Affair</td>
<td>Safety</td>
</tr>
</tbody>
</table>

**Table 3.2: Determination of The Auditees Team. Source: The author**
Each department will be audited separately against the processes that it controls, manages, operates and receives. Each department will be audited as the owner of its process and as an internal customer of different supplied processes. Consequently, all of the five departments will be audited collectively.

iii Reasons for Not Selecting the other Seven Departments:

When determining the research population and sampling, the materiality was evaluated in accordance to the guides of the ASQ Auditing Handbook (Russell, 2013), which recommends for the organization to take into account the following thoughts.

   a  Criticality of the process.
   b  Cost of the system (e.g. material, software).
   c  Cost of operation (e.g. personnel, third party services).
   d  Potential cost of errors or non conformities.

The Materiality is defined in AICPA GAAS, Section 320, 01-A16 by the statements below:

- “To limit audit risks and to obtain reasonable assurance, the auditor must place the emphasis on the processes and systems deemed material (synonym: critical).
- Auditors measure materiality in the context of significance of a source or process with regard to its effect or impact on the scope of the audit”.

Therefore, by evaluating these recommendations and definitions with regard to the materiality, the five departments (shown in Table 3.2) were selected to be the main participants and the remained seven departments were excluded. The excluded seven departments are: Finance, HR, Contracting, Purchasing, Telecommunication, Legal, Servicing and Public Relation. The main reason of this exclusion is that these seven departments have lower significance with regard to the above four points (a, b, c and d of this section (3.9.3.iii)).

The materiality will also be considered during the selection of audit samples that need more investigation by the auditor during the audit phases, i.e. document review and interview.
In addition to the above described research participants, who will be the auditees (Sample 1), further two samples (Sample 2 and Sample 3) were selected. They are as follows:

- **Sample 2:** The managers of the non audited departments, who will participate in focus group meetings (two management review meetings), which are planned to be conducted after completing the audits for the purpose of analyzing of audit findings.

- **Sample 3:** GMRA internal auditors, who will participate in the focus group workshop that is planned to be conducted to validate the research and confirms answers to research questions, and to validate the contents of the PAF.

Therefore, it is important to determine the most applicable methods for data collection, data analysis and research validation.
Chapter 4: Research Methods of Data Collection and Data Analysis Applied in this Case Study

4 Research Methods Applied in this Case Study

This chapter explains the methods of data collection and data analysis that were applied in this research study, in order to explain how the research questions and research objectives were tackled.

The aim of this chapter is to discuss the procedure of conducting the audits of this case study, with a focus on measuring the performance which contributes towards eliminating risks. It discusses the methods of data collection, data analysis, validation and evaluation. In other words, this chapter aims to accomplish part of RO 3 and RO 4.

Section 4.1 describes how the appropriate data, collection and analysis methods are determined. Section 4.2 explains the types and stages of data collection methods and section 4.3 explains the methods of data analysis. Section 4.4 describes how this research study is validated.

Finally, section 4.5 describes how this research study is evaluated.
4.1 Determination of Appropriate Data, Information and their Research Methods

4.1.1 Sequences of the Research Methods in this Case Study

The sequence of the data collection, analysis and validation of this research study can be illustrated in Table 4.1.

<table>
<thead>
<tr>
<th>Serial Number</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data collection and data analysis</td>
</tr>
<tr>
<td>1</td>
<td>Development of the PAF based on; 1) the CAF, 2) the result of review of the relevant audit standards and guidelines, and 3) the result of the documentation review, complaint and practical needs of the research organization (GMRA).</td>
</tr>
<tr>
<td>2</td>
<td>Review of the results of GMRA previous internal audits and certification audit of 2016.</td>
</tr>
<tr>
<td>3</td>
<td>Performing eleven audits at the selected five departments, using the criterion of the PAF.</td>
</tr>
<tr>
<td>4</td>
<td>- Determination of the audit evidence of these audits. &lt;br&gt; - Transforming the audit evidence into audit findings.</td>
</tr>
<tr>
<td>5</td>
<td>- Categorizing the audit findings into conformities or non conformities (NCs). &lt;br&gt; - Categorizing the non conformities into NCs, risks or OFI.</td>
</tr>
<tr>
<td>6</td>
<td>Determining the root causes of NCs and risks identified.</td>
</tr>
<tr>
<td>7</td>
<td>Preliminary analysis of audits data, including the NCs, risks and their root causes.</td>
</tr>
<tr>
<td>8</td>
<td>Performing part 1 of the focus group management review meeting to analyze the audits data by taking into account the views and comments of the managers of the other departments.</td>
</tr>
<tr>
<td>9</td>
<td>- Performing part 2 of the focus group management review meeting to analyze the research data (audits data and MRM data) and to develop metrics that can be used to evaluate the research data (RD) and the PAF. &lt;br&gt; - Analyzing the research data by coding and themes.</td>
</tr>
<tr>
<td></td>
<td>Research Validation</td>
</tr>
<tr>
<td>10</td>
<td>Performing three focus group workshops for validating the RD and the PAF.</td>
</tr>
<tr>
<td>11</td>
<td>Evaluating the RD and its PAF from the perspective of added value.</td>
</tr>
<tr>
<td>12</td>
<td>Revising the PAF to its final revision to be limited to the questions and guidelines that have revealed to discovering of factual, chronic and systematic audit findings. &lt;br&gt; Also, to combine the questions that led to the answers of the same meaning.</td>
</tr>
<tr>
<td>13</td>
<td>Evaluating the research data and its PAF to guide the conclusion of this study.</td>
</tr>
</tbody>
</table>

Table 4.1: The Sequence of the Research Methods Activities. Source: The author

All of the above elements (1-13) will be performed in sequentially, with exception of elements 2 and 3 which will be undertaken in parallel.
4.1.2  Determination of Appropriate Data and Information

Getting appropriate and critical data is one of the important factors in the topic of audit, and failing to recognize some critical data would lead to reducing the effectiveness of the evaluation (Hoyle, 2004). With reference to the ISO 9001:2015 Standard, which is the main model of this case study, the terminology of appropriate is mentioned in the following clauses:

- Clause 9.1.1, which requires “the organization to retain appropriate documented information as evidence of the results”.

- Clause 9.1.3, which requires “the organization to analyze and evaluate appropriate data and information arising from monitoring and measurement”.

That is to say, in order to ensure that the collected data is appropriate, its collection method has also to be appropriate and adequate.

4.1.3  Adequacy and Appropriateness of Data Collection Method

The data collected have to be representative of reality, and thus what an auditor does and how he goes about collecting data are central to good performance measurement.

If inappropriate or invalid methods for a situation are used, the data collected and in turn its interpretations will be considered invalid.

Guerra-Lopez (2008) reports that the validity of findings and recommendations are related to the rigor of the data collection. Committing to use data collection methods that are familiar before knowing what data must be collected and from where or whom, could lead to incomplete or irrelevant data sets. It is an error to pick the tools first and then be limited by the data that tool will generate. For example, a tool such as a questionnaire may be best for collecting specific hard or soft data from a large range of participants. Questionnaires are not adequate tools to measure actual learning or individual performance gains or the performance gains of the organization.

Therefore, the research methodology tools in this case study will not be limited to the questionnaire and semi-structured interview, but will include management assertion by performance of materiality and risk assessment to minimize the risk of reaching an incorrect conclusion based upon audit findings.
To ensure collecting valid, appropriate and the most important data, the main data collection tool in this research study will be a diversity of audits and focus group. Each method will be applied by using a mix of few tools. The audit’s tools will include the checklist, interview, observation, analysis and technical verification. The tools of the focus group will include two management review meetings and three workshops. Also, at each tool, the triangulation technique will be applied to generate data in multiple approaches as suggested by Silverman (2011) and to give deeper meaning from different data and methods as recommended by Guion, Diehl and McDonald (2011).

4.2 Types and Stages of Data Collection Methods in this Case Study

4.2.1 Preamble

The primary source of data in this research study is the results of audits, which are classified at the first stage of collection as audit evidence that will be corroborated to produce the audit findings. The audit findings will be analyzed by use of the analysis methods identified below in sections 4.2.4 and 4.3.

The data collection methods in this research include the following phases:

Phase 1: Documentation Review by; 1) review of the results of GMRA previous internal audits, certification audit and management review and 2) review of the relevant audit standards and guidelines, such as the ISO 9001:2015 Standard, the ISO 19011:2011 Guidelines, and the ISO 27008:2011 Guidance and ISO 17021 Guidance.

Phase 2: Auditing.

Phase 3: Focus group

4.2.2 Phase 1: Data Collection by Reviewing the Current Position (Documentation Review)

Clause 8.2.5.1 of ISO 27008:2011 (the Guidance for auditors on ISMS controls) states that “Auditors should take advantage of existing review information to facilitate more effective audits...The reuse of review results from the previously accepted or approved reviews of the information system should be considered in the body of evidence for determining overall control
effectiveness...”. Therefore, the records that will be reviewed at this phase of this case study include the following.

- Results of previous internal audit reports of 2016.
- Results of the latest certification audit (2016).

It is identified in Clause 8.2.5.4 of the ISO 27008:2011 Guidance that “as the time period between current and previous reviews increases, the credibility of the previous review results decreases”. As a result, the previous internal audit reports of 2015 and 2014 were not examined in this research study.

4.2.3 Phase 2: Data Collection by Audit

4.2.3.1 Stages of Data Collection by Audit

As stated above, the primary source of data is the audits results. Each audit will comprise the following steps.

- Document Review
  It consists of a systematic and methodical review of documents and records.
- Interview
  By asking participants (auditee) questions (verbal and written) to gather audit evidence.
- Observation
  The phenomenon observed by the auditor at the auditee’s premises.
- Analysis
  It consists of a systematic and methodical analysis of data or information.
- Technical Verification
  To validate the effectiveness of a technical process or control, the auditor can ask to be present for a complete process, for example, analysis of configurations, scanning etc.

Since the audit time is limited, the auditor usually uses at least one of the audit tools to list the criteria. Hoyle and Thompson (2004) and Russell (2013) determined such tools as checklist, guidelines and process mapping.
4.2.3.2 Tools of Audit

Audit checklist can be used to improve the entire audit process, from planning to execution and through post-audit documentation. Kausek (2008a) shows that the auditor is never confined to only asking questions from the checklist. The checklist is a tool, not a procedure. The checklist should be designed to include the types and contents of questions that will:

- make significant contributions.
- enable the auditor and encourage the auditee to uncover more critical data and recognize more potential risks and indicators prior to the potential failure.

The checklist usually contains a listing of required items where audit evidence is needed. It is either a list of questions to answer or statement to verify.

In addition to the checklist, the guidelines can be used as an additional tool. The guideline consist of written attribute statements that are used to evaluate product, process, or system. The guidelines are usually prepared by the audit team based on their documentation review prior to the audit. They are used as supplementary documents that help the audit practice with additional information to plan the audit (Russell, 2013).

Many auditors find it useful to draw a flowchart of the operations about to be audited. What processes are performed and what are the linkages? And the primary tool for the process auditing is creating a process flow-diagram (Russell, 2013). Therefore the process mapping will be one of the preparation questions at all audits of this case study.

The audit tool in this research study will include checklist, guidelines, flowchart, documentation review, interview, observation, familiarization tour and technical verification. However, while there is no interview in self-auditing, the main tool of this audit will be a mix of the checklist and guideline in the form the PAF. The checklist is to structure and standardize the audit approach and the guideline is to promote the awareness of auditees and enable them to conduct these self-audits effectively.

The PAF is designed to integrate the ISO 9001:2015 QMPs in the form of their relevant management tool/techniques, as shown in Appendix 1.
This PAF will be used as a tool to conduct the audits in this case study, as explained below in sections 4.2.3.3, 4.2.3.4, 4.2.3.5 and 4.2.3.6.

4.2.3.3 Interview Questions during Audit

Posey (2015) divided the interviewing questions into leading question, evidence based, open ended question. The types of evidence based and open ended questions have been adopted in this research study because both of them accord with the process approach audit method that is applied in this research study (as explained earlier in section 2.3.1.3.2).

Interviews have certain advantages over questionnaires in their flexibility: “...the interviewer can follow up ideas, probe responses and investigate motives and feeling...” (Bell and Waters, 2014, P. 178). Before embarking upon any interview, the interviewer (auditor) should be aware of the type of interview that is appropriate for his audit needs. The types of interviews can be summarized as follows:

- Structured, semi structured and unstructured interviews.
- Individual or group interviews.
- Face to face or telephone interviews.

In this case study, the researcher, who will be the auditor, will start auditing and interviewing the participants by using the semi structured, face to face, individual and group interviews. The audit’s tool of the PAF (Appendix 1) has been designed to apply all of these interviews, in addition to its use in self-auditing (stage 1 audits) that will be conducted by the auditees at their departments without the interview.

The interviews of the main audits (stage 2 audits) will be accompanied with the audit tool of ‘Observation’, because “…the interviews reveal only how people perceive what happens, not necessarily what actually happens. Observation can be useful in discovering whether people do what they say they do, or behave in the way they claim to behave” (Bell and Waters, 2014, P. 211).

During this stage of data collection by interviews and observations, the auditor will follow the guidelines of ISO 17021 Clause 9.3.1.3, which gives the following advice.

a “Collecting information from information sources by use some of the evidence collection procedures which include: records and documents review, interviews, observation, analysis and technical verification.
b Conducting audit test with appropriate procedure (by assembly, corroboration and evaluation of audit evidence).

c Drafting the audit findings and non conformity reports after evaluating the audit evidence against the audit criteria.

d Quality review of the audit findings to assure the consistency of the audit conclusion.”

Therefore, the journey of this data collection by the audits of this case study will be passed through the destinations that are shown in Fig. 4.1.

Fig. 4.1: Stages of Audits Data Collection. Source: The author

At each stage of Fig. 4.1, the data will be determined and then subjected to corroboration, verification, validation and evaluation in accordance to the following procedures.

4.2.3.4 Determination of Audit Evidence

i Definition of Audit Evidence

Audit evidence is defined by Clause 3.3 of the ISO 19011:2011 Guidelines as: “records, statement of fact or other information, which are relevant to the audit criteria”.

The ISO 19011:2011 Guidelines state that “there are several types of evidence which exist that the auditor may collect and can contribute to determine the conformity of a process to an audit
The names of the evidence types may vary according to the audit firms and certification bodies. Most of the internationally recognized and accredited certification bodies, such as BSI, BV, Lloyds Register and PECB grouped the audit evidence into the following six major categories:

- **Physical:** Observation of the product at different moments during internal processing and delivery to the intended destination, in order to verify if it maintains conformities to requirements.
- **Confirmative:** Confirmation from an external firm that conducts product inspection that the product preservation aligns with the product requirements.
- **Technical:** The auditor’s observation notes on the analysis of use of suitable tools and equipment related to the preservation of products and services.
- **Analytical:** Analysis of test results done by the organization that analysis the level of degradation of the product during internal processing and delivery to the intended destination in order to verify if it maintains conformity to requirements.
- **Documentary:** Verification of the documented updated procedure.
- **Verbal:** Interview with the technician responsible for the preservation of the product” (PECB, 2016).

Evidence often comprises several types at once. The more evidence is objective and external to the organization, the more it is considered reliable, which means that the Verbal evidence (f) has the lowest reliability and the Physical evidence (a) has the highest reliability, because the physical evidence is more likely to be factual rather than judgmental and verbal evidence would need to be corroborated by further evidence.

### ii Forms of Audit evidence

The ASQ Auditing Handbook (Russell, 2013) clarified that the evidence can be obtained through many sources like:

- Record (evidence of performing work, e.g. report, certificate and as built drawing).
- Document (Input of work, e.g. procedure, policy, instruction and law).
- Observation of activities, production and process provision is done in accordance with the standard requirement (Product /equipment / operation / condition).
- Interviews with auditees (individually and group).
- Databases and website: The organization’s employee.
- Indicators: Dashboards concerning indicators on product defects.
- System Configuration: Configurations demonstrating the procedures applied to documentation management (e.g. labeling, filing, storage).

The above sources of evidence have also been clarified by Porter, Simon and Hatherly (2014), who emphasized that the auditor would usually need to use a combination of evidence collection procedures to create his audit evidence.

Subsequent to the completion of collection of the above audit evidence, an appropriate evidence analysis will be carried out through assembly, corroboration, verification, validation and evaluation of audit evidence (audit test), in order to establish sound audit findings.

iii Test and Assembly of Audit Evidence

In order to assemble audit evidence and to establish sound findings, the auditor will systematically look for more evidence to confirm his audit notes and evidence by applying the process of corroboration, triangulation, verification, validation and evaluation, that are explained below in sections iv, v and vi respectively.

iv Corroboration of Audit Evidence

Corroboration is applied by the auditor when he performs other types of test to confirm his initial observation. It is verifying information to get reasonable level of assurance.

Russell (2013) recommends that the audit evidence which is based solely on interviews should always be corroborated by the auditor by use of another method, such as observation, document review and technical analysis. Corroboration methods are used by the auditor to validate data that could be considered unreliable or questionable.

v Verification and Validation of Audit Evidence

Auditors collect evidence to ensure that requirements are being met. Auditors may verify and/or validate the requirements (audit criteria are being met). Verification is checking or testing and validation is the actual performance of process’s intended use. The examination of
record, document or interviewing is verification. The observing or using the product or process is validation (Russell, 2013).

**Evaluation of Audit evidence**

Evaluation is defined by Russell (2013) and Porter et al. (2014) as an act by which the auditor judges the results of the previous procedures to ensure that the audit evidence is sufficient, relevant and reliable.

During the evaluation procedure, the auditor must take into account, the materiality of information to determine whether the evidence is sufficient, relevant and reliable. The auditor shall evaluate the quantity and quality of the information and ask himself, is there relevant, reliable and enough evidence to have a reasonable assurance?

To achieve some degree of reliability in the audit evidence, the researcher (auditor) will involve other people, as opposed to relying on the interpretation of one individual and this secure replication where possible. This involvement will be achieved in this case study by auditing all departments’ managers in combination (AIC).

As a result of the corroboration, verification and validation that will be undertaken by means of auditing all participants in combination, the audits evidence will be transformed into audit findings in the form of non conformities (NCs), risks and/or opportunities for improvement (OFI).

**4.2.3.5 Determination of Audit findings**

With reference to the ISO 19011:2011 Guidelines, Clause 6.4.7, “the audit findings are results of the evaluation of the collected audit evidence against audit criteria. The audit findings are the determining factor in formulating the conclusion of the audit. It consolidates all relevant information relating to a particular verification, where a potential lack or ineffectiveness of a process exist”.

According to Clause 3.9.5 of the ISO 9000:2005 and to Clause 3.4 of the ISO 19011:2011, the audit findings are categorized into: conformity, non conformity, compliance, non compliance, opportunity for improvement and good practice.
In reaction to the problem identification and rationale that was stated early in section 1.2 and to the new changes in the ISO 9001:2015 Standard that focus on the RBTC, the audit findings in this case study will also include the risks, in addition to the non conformities (NCs) and OFI, because it is subscribed by ISO 9001:2015, ISO 19011:2011 and ISO 19011:2018 that the risks should be considered as a potential non conformities.

To assure of the reliability and validity of those audit findings, the auditor will focus only on the NCs, risks and OFI, which are based on:

- Verifiable fact for which there is no doubt to these types of audit evidences (Factual).
- Their repeat frequency throughout all of audited processes and departments (Systemic).
- Their repeat frequency over time (Chronic).

As a result of the preliminary review of the previous internal audit reports of GMRA (2016), it is noted that GMRA internal auditors focused on recording bad job (non conformities) and good jobs (positive findings). Peckford (2017) shows that many organizations focused on negative findings only. However, in this research study and based on the rationale identified above in Section 1.2, the positive audit findings that will be considered will be limited to the opportunities for improvement (OFI) and good practices. For that reason, the audit findings in this research study will be classified into non conformities, risks and OFI. However, these findings will be determined based on the definitions that have been reported in literature, which include the ASQ glossary, Russell (2013), Porter et al. (2014), ISO 9000:2015 Standard and Oland (2016).

The ASQ glossary defines the non conformity as "non fulfillment of a specified requirement" and the word "specified" is excluded from the ISO 9000 definitions.

Oland (2016) preferred for the definition to include criteria to consider the actual or potential effects and severity of the non conformity that is, whether the reported non conformity is representative of the vital few.

Consequently, in this research study, the requirements which the participants will be audited against, are those that have been embedded within the PAF, which imply the following.

- The management tools and techniques those are related with the ISO 9001:2015 QMPs.

- The recommended problems solutions that resulted from the LR (Chapter 2).

For the purpose of analysis validity, it was helpful for all auditors to categorize the non conformities (NCs) into: factual NCs, judgmental NCs and projected NCs, in order to evaluate their weight, criticality, materiality, causes, effects and consequences. These different types of non conformities were defined by Russell (2013) and Porter et al. (2014) as follows:

- **Factual Non Conformity:**
  It is based on a verifiable fact for which there is no doubt to these types of audit evidence.

- **Judgmental Non Conformity:**
  It is based on differences between the actions that the organization is taking and what the auditor examines and considers inappropriate.

- **Projected Non Conformity:**
  The auditor’s best estimate of misrepresented evidence in populations, involving the projection of non conformities identified in audit samples to the entire population from which the samples are drawn. On sampling it is based on the auditor’s estimates.

The factual non conformity has the highest reliability and the projected one has the lowest reliability and would need to be corroborated by other evidence (Russell, 2013).

In connection with the aim and RO 3 of this research study, the non conformities (including the risks) of this case study will be limited to the factual NCs that will be issued in cases where:

- The requirement is not followed ‘Non fulfillment of a requirement’. This will cover the audit of conformance.

- A requirement related to an intended or specified use is not followed. This will cover the audit of performance.

- A new risk, threat and OFI are identified. This will cover the audit of risk management by tying finding classification to risk assessment.
- Demonstrating ineffectiveness. This will cover auditing for conformance, performance, risk management and improvement collectively.

To validate the audit findings of this case study, the correct and accurate definition of the non conformities, risks and their causes will be assured by use of the appropriate tools that are interrelated to problem definitions and problem solving. ISO 19011 Clause 6.5.1 (Preparing the Audit Report) lists some desirable attributes for the audit reports, “these attributes are: complete, accurate, concise and clearly recorded.”

For that reason, the non conformities of this case study including risks and OFI will be subjected again to corroboration, evaluation, validation and analysis by involving other departments’ managers, who will be invited to attend Part 1 of the Management Review Meeting (MRM) to discuss, validate and confirm the audits findings, particularly those that are correlated to the non audited departments and to the organizational overall performance.

During this meeting, the root causes of the AFs (NCs, risks and/or OFI will also be determined in accordance to the procedure explained below in section 4.2.3.6.

4.2.3.6 Determination of the Root Causes of the Non Conformities

In order to analyze the NCs correctly, the researcher looked for their causes. To help the participants to determine the root causes of non conformities correctly, some of the management tools that are related to Problem definitions and solving were determined and applied. “A Problem Well Defined is a Problem Half Solved” (Anonymous).

The first step in the problem solving process is to ensure that the description of the problem is stated in clear, specific terms without drawing conclusions or making assumptions. In order to clearly define the problem, information needs to be collected (Ketola and Robert, 2003). One recognized tool that is recommended by Ketola and Robert (2003) to be used by the auditor is the 4W/2H/1C, which are abbreviations for: What, Where, When, Who, How much, How often and what Consequences. The 4W/2H/1C formula will be used in describing of the non conformities determined as a result of the eleven audits of this research study.

Zaccaro (2006) identified four basic steps in solving a problem, which are: defining the problem, generating alternatives, evaluating and selecting alternatives and implementing solutions. He
also noted that a good problem definition is helpful in ensuring that the problem solver deals with the real problem, not its symptoms. This implicitly means dealing with causes, not merely with results.

The Process owners need to be equipped with enough knowledge to create a cause and effect tree that will enable them to analyze and identify the root cause of an event or condition (Rooney, Heuvel, Lorenzo and Jackson, 2009). This will be followed by utilizing the PAF to equip the auditor and auditee with the tools needed to analyze and identify the root cause of problems and audits non-conformities.

Barsalou (2016) encouraged the use of root cause analysis (RCA) helix to choose the right tools and guide investigations. To choose the right approach to RCA, he presented the example of “While a carpenter may find a hammer to be the optimal tool for driving a nail, it is not the proper tool for sanding a piece of wood. Like a carpenter, somebody performing an RCA must be able to quickly switch to the appropriate tool” (Barsalou, 2016, P. 4).

Therefore, the tools which will be selected in this case study at the stage of determining AFs causes will include the following.

- Tools related to Problem definitions, such as 4W/2H/1C.
- Tools related to problem solving, such as RCA and 5Whys.

### 4.2.4 Phase 3: Data Collection and Data Analysis by Focus Group (FG)

The aim of this phase is to conduct further data collection and analysis by interviewing the managers of other departments, who have not been covered by the audits of this case study. These FGs will be conducted in the forms of MRM and workshops.

#### 4.2.4.1 Background and Justification

The Focus Group is defined by Neuman (2014, P. 471) as “A group of people informally interviewed in a discussion setting that is participating in a qualitative research technique....Providing very clear instructions and carefully selecting participants for focus groups can greatly shape their outcome...”. As cited by Neuman (2014), Wibeck, Dahlgren and Öberg (2007) note that “since the interpretative frames and the previous experience of the participants...
may differ, it is crucial to ensure that the preconditions for focus group participation are clear to all participants before the discussion starts."

The Focus Group method in this research study will be applied at the following three stages.

**4.2.4.2 Focus Group by Auditing Multiple Departments in Combination (Stage 1 FG)**

After completing the audits at the five selected departments, all managers of the five audited departments will be audited in combination (AIC). During this audit, the interviewees will be the group of the auditees, who are the managers of the five selected department.

**4.2.4.3 Focus Group by Management Review Meeting (Stage 2 FG)**

The second FG will be in the form of the management review meeting that will be held to confirm, analyze, evaluate and validate the audit findings. The interviewees will be all of the department managers including the five auditees. During this meeting, further research data will be determined, this additional data includes the views and comments of the managers of other departments, who have not been covered by the audits of this case study.

Key questions raised by Scangas and Grey (2015, p. 4) were: “what are the most relevant methods and measures that could be used to measure the effectiveness of audit programs? How can we identify the key trends that will influence the internal audit activity in the future?”. As a result, metrics of performance evaluation of the audits of this case study and their framework will be developed and agreed during this management review meeting.

**4.2.4.4 Focus Group by Workshops (Stage 3 FG)**

This FG will be conducted in the form of workshops that will be held to revise and validate the PAF. The interviewees will be the five auditees, in addition to the five internal auditors of GMRA organization. AICPA GAAS, Section 610, 01-A50 states that “Internal auditors could be used to provide assistance during a management system certification audit”. Therefore, the internal auditors of GMRA were invited to provide assistance.
4.3 Research Methods of Data Analysis

4.3.1 Significance and Rationale of Data Analysis

The analyzer (who will be the researcher) has to be aware of the significance of the data collected, as recommended by Djebarni et al. (2014), who states that the analysis of data can be defined as the process of examining it in detail to determine its significance. This process involves looking for patterns that exist so as to gain a better understanding of the data’s meaning and significance.

The analyzer should ensure that the output of his data analysis will answer the research questions and determine the achievement level of research objectives.

Scangas and Grey (2015) clarified that the internal audit supports the organization in accomplishing its objectives by bringing a systematic, independent and disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes. Thus, the stages of data analysis in this study will include the analysis from the perspectives of risk management, in addition to the perspectives of performance, improvement and added value.

4.3.2 Stages and Procedure of Data Analysis

Whereas the data collection methods were divided into four phases, the data analysis methods will also be interrelated to those phases and that is to say that the data analysis will be performed in synchronization with data collection.

Also, as some of management tools will be used during the stage of data collection, some other relevant tools will also be used during the stage of data analysis. But the question is; what kind of tools that can be used? And how to integrate the tools within the audit? This was RQ2 which has been partly answered earlier in section 2.5 by determining the tools that could be integrated within the aimed framework, but in this case study, the PAF will be tested to demonstrate the effectiveness of the selected tools and to find out how their integration is achieved?

4.3.3 Strategies for Qualitative Data Analysis

Coffey and Atkinson (1996, p. 190) states that “in qualitative studies, the most critical stage is the analysis”. Before starting the research data analysis, the researcher must go through
different phases to prepare the data for the analysis. The phases start with recording the data. Next is categorizing the data, as “the qualitative data are non-standardized and require classifying into groups to ease the process of using them” (Saunders et al. 2009, p. 323).

Saunders et al. (2012, P. 564) stress that data collection, data analysis and the verification of relationships and conclusions are interrelated processes. Analysis occurs both during and after the data collection stage and in fact, the analysis can actually suggest that the collection of additional and different data is required.

Corbin and Strauss (2008) suggest that the set of categories the researcher chooses can be derived from the following three main sources:

- Terms which emerge from the data.
- Actual terms used by the research subject.
- Terms used in the existing literature, standards and guidelines.

A coherent set of categories will provide the researcher with a well structured analytic framework within which he can undertake his analysis.

Saunders et al. (2012, P. 557) pointed out that “the process of qualitative research involves the following four steps:

- Categorization.
- Unitizing the data.
- Discovering relationships and refining the categories.
- Developing and testing hypotheses to reach conclusions.”

Coffey and Atkinson (1996, p. 26) addressed that “the important phase of coding the data, which is organizing, managing and retrieving the most meaningful pieces of the data by labeling (coding) them and relating each label to a particular idea, theme or concept. This process breaks down the data to be more analyzable”.

In qualitative research, a code is usually “a word or a short phrase that symbolically assigns a summative, salient, essence-capturing and/or evocative attribute” (Saldana, 2012, p. 3). The process of coding thus is “reducing the data into meaningful segments and assigning names to the segments” (Creswell, 2012, p. 180).
At this stage of coding, the researcher will reduce and rearrange the data into a more usable and comprehensible form. Unitization can be accomplished in either of two ways:

- Manually, by writing category codes in transcript margins and compiling an index of where the particular categories occur in the text.
- Using Computer Aided Qualitative Data Analysis Software (CAQDAS) such as NVivo 10.

Whereas, the researcher (analyzer) will look for patterns within data and identifies relationships between themes, he will be able to develop propositions to test them. The appearance of an apparent relationship will need to be tested to see if it is an actual relationship.

The researcher should note that the propositions or hypotheses are emerging inductively from the data. To test a proposition, he will need to look for alternative explanations and negative examples that do not agree with the pattern or relationship being tested. “Only by testing the hypotheses will the researcher be able to formulate valid conclusions” (Djebarni et al., 2014).

As new themes and relationships emerge, it may be necessary to recategorize the data already collected and to see whether this data conforms to the newly observed relationships.

For this reason, the data of this research study will be categorized and recategorized through the following stages.

- After completing the audits, to categorize the audit data and determine themes.
- After the focus group management review meetings, to determine further themes, recategorize the data and categorize the relationship between themes.
- Before and during the focus group workshops to recategorize the relationship between these themes.

Consequently, the data will be utilized by the scanning the audit findings and research evidence to identify segments of data that can be labeled using the set of categories the researcher has defined. A unit of the data could be a few words, a sentence, a couple of sentences or a complete paragraph, or some other grouping of text that can fit within the scheme of categories.

Because of the importance and the limited numbers of audits conducted during this research study, the author of this research makes use of tables manually to arrange the data into groups.
that will help in the later stages when he will be trying to identify any patterns within the data. Therefore, there was no need to use any type of the Computer Aided Qualitative Data Analysis Software (CAQDAS).

Then, the researcher begins to identify the key themes, with their intensities, frequencies, relationships, linkages, contrasts, connections etc. Taking into account that the intensity means the repetition rate of such theme at each of the audited process and the frequency means the repetition rate of such theme at all of the audited five departments.

4.3.4 Analysis methods

Qualitative data analysis is defined by Pilot and Beck (2008) as “the process of fitting data together, of making the invisible obvious, of linking and attributing consequences to antecedents, it was a process of conjecture and verification, of correction and modification, of suggestion and defense”. In this qualitative research, data analysis is not a separate phase, but occurred concurrently with data collection. The analysis methods that will be applied in this research study consist of:

i. Interpretation of Audits and Research Data During the Stage of Data Collection

The Data Analysis starts by the time of data collection and end by the time of completing of research validation.

In the interpretation procedure, it is recommended to validate the audit evidence and audit findings from the participants’ point of view. This is called “respondent validation” (Silverman, 2011, p. 369). The application of this procedure is to take the transcribed interviews with the interpretation back to the participants to confirm that what has been written was what they meant (Creswell, 2012).

Creswell (2012, p. 252) cited Lincoln and Guba (1985) who considered this procedure as “the most critical technique for establishing credibility”. Also, this procedure has already been recommended by Riege (2003, p. 83) who stated that “this technique is used for establishing credibility in qualitative research”.

In this research study, this procedure (respondent validation) will be applied by interpreting all of the audit findings by the researcher. Then, the result of this interpretation will be presented to the participants at the closing meeting of the last audit and at the management review meeting.
Preliminary Analysis of the data of this research by Coding

The research data will be organized, indexed and converted into smaller manageable units that could be reviewed and retrieved. The researcher will code the research data in accordance to Neuman (2014, P. 481-484) by the following steps.

<table>
<thead>
<tr>
<th>Step</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Examines the data to condense them into preliminary analytic categories (Open coding)” (Neuman, p. 481)</td>
<td>During and after the auditing of the five departments in combination (AIC).</td>
</tr>
<tr>
<td>“Organizes the codes, links them and discover key analytic categories (Axial coding)” (Neuman, p. 482)</td>
<td>During and after the management review meeting.</td>
</tr>
<tr>
<td>“Examines previous codes to identify and select data that will support the conceptual coding categories that were developed (Selective Coding)” (Neuman, p. 484)</td>
<td>After the management review meeting.</td>
</tr>
</tbody>
</table>

Table 4.2: Data Analysis by Coding. Source: Adopted from Neuman (2014, P. 481-484)

Preliminary Analysis of the Data of This Research by Themes

The research data will be thematically organized by topics, context and consequences, as recommended by Seidel and Kelle (1995). Hence, they will be interpreted to look for patterns, paradoxes and relationships within and between these different themes (Contents Analysis by Themes). Each theme will be looked to draw out the aspects of each that the auditor believes is important for auditing performance, effectiveness and efficiency. The interrelation and links between each of the determined themes are manifested in the form of Table 4.3.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Its Definition in this case study</th>
<th>Relationship with indicators of its effectiveness</th>
</tr>
</thead>
</table>

Table4.3: Elements of Data Analysis by Themes. Source: The author

The determined themes will be displayed in different way to explore further patterns and relationships within the stages of audits and to explore their importance with regard to data analysis. Then new relationships will emerge.
Consequently, the result of this thematic analysis will be presented to part 2 of the management review meeting to be reviewed against the research rationale in order to build up metrics for performance evaluation of the audits and the framework of this case study.

iv Analysis from the Perspective of Risk Management

To verify whether the audits of this case study have successfully answered RQ 4, which states; Can the risk assessment be undertaken during internal audit? And how? The audit findings will be analyzed and evaluated to find out whether the risks of the audited process were identified during the audits of this case study and whether the RBTC is successfully incorporated. Also to find out whether the counter measures of these risks could be developed.

The output of the above research data analysis will be used to validate the research study and its PAF by the following validation methods.

4.4 Methods of Research Validation

4.4.1 Validation Methods

The selection of research validation and evaluation procedures in qualitative studies depends on the researcher, how he is going to build the credibility and test it within his research. Silverman (2011, p. 360) emphasized that “the qualitative researcher ought to guarantee transparency through all the research. This can be approached by providing detailed clarification and explanation of the research strategy and methodology in all stages, from collecting the data to drawing conclusions”.

It has been cited by Djebarni et al. (2014, P. 129), that “in qualitative research, validation is commonly undertaken in one of four ways:

1. Checking conclusion against further data sets.
2. Triangulation.
3. Testing consumer and/or actor response (Silverman, 1985).
4. Testing the feasibility”.

Due to the justifications that are shown below in sections 4.2.2 and 4.4.3, the author of this research study believes that way number 2 (triangulation) and way number 4 (Testing the
feasibility) are the most suitable methods that can be used to validate the results and the proposed auditing framework of this research respectively.

4.4.2 Validation by Triangulation

The triangulation is a powerful technique that facilitates validation of data through cross verification from two or more sources. In particular, it refers to the application and combination of several research methods in the study of the same phenomenon (Bogdan and Biklen, 2006). Silverman (2011) addressed that the triangulation can give deeper meaning from different data and methods.

Therefore, this author believes that the triangulation can be undertaken in this case study during the stage of data collection by:
- Applying different audit methods to corroborate the audit evidence.
- Using a focus group by auditing many departments in combination to validate the audit findings.
- Using a focus group by conducting management review meeting to revalidate the audit findings.

The triangulation will also be undertaken in this case study during the stage of data analysis to determine whether the auditing framework did provide a practical guide for internal auditing. The PAF will be validated by conducting a workshop. The aim of this workshop is to get the view of further participants, who are the five internal auditors, in addition to the five auditees, who are called to comment, corroborate, confirm, validate and evaluate the proposed PAF based on the Platts (1993) Evaluation Criteria.

4.4.3 Validation by Applying Platts (1993) Evaluation Criteria

The Platts (1993) criteria have been used by some scholars in operations management (e.g. Canez, 2000 and Tan 2002). The Platts (1993) criteria were selected for the validation in this research study because; 1) they can be used during the stage of data collection by formulating some questions in the PAF from its criteria, 2) they can be used during the stage of data analysis by evaluating the audit evidence and audit findings, and 3) they have been found appropriate with this research methodology about interviewing the participants by both direct and indirect questioning (where answers could be crosschecked) are followed.
As a result, the attendees of the workshops were called to answer and comment on the following questions that were formulated from Platts (1993) evaluation criteria:

a- Feasibility: Could the process be followed?
b- Usability: How easily could the process be followed?
c- Utility: Was the process useful?

The feasibility will be applied by repeating the PAF in five different departments with different auditees, greater confidence in the more general feasibility of the framework will be achieved. The attendees will be required to answer the question:

Can the framework be followed?

The usability will be applied by identification of problems and risk in each section of the PAF, hence, the PAF will be tested and refined by its application. The attendees will then be required to answer the question:

How easily can the framework be followed?

The utility will be applied by when the audits are completed, to judge the success of the PAF. Two possible ways of doing this will be identified:

Firstly, at a practical level, by comparing the output of the PAF with the output of the previous internal audits and to identify the number of improvement opportunities addressed. This will the direct output of the audit PAF.

Secondly, at a subjective level, the internal auditors and department managers will be interviewed to establish their reactions to PAF. Finally, the attendees will be required to answer the question:

Are the PAF and its research results useful?

4.5 Evaluation of the Research Data Analysis

Golafshani (2003, p. 600) stated that “while reliability and validity are used separately in quantitative studies, these terms are not dealt with separately in qualitative research. The research evaluation terminology in qualitative research uses terms that encompass both, such as credibility, reflexivity, transferability and trustworthiness”. In general, these terms are meant to be replacements for validity and reliability in qualitative research”. Therefore, it was necessary
for this author to set up trust on his research methods, confidence in his research findings, minimize bias and maximize honesty.

The selection of the research evaluation procedure in qualitative studies depends on the researcher, how he is going to build the credibility and test it within his research. Silverman (2011, p. 360) emphasized that “the qualitative researcher ought to guarantee transparency through all the research. This can be approached by providing detailed clarification and explanation of the research strategy and methodology in all stages, from collecting the data to drawing conclusions”. For that reason, this author will go to build the credibility and test it within his research by the following evaluation:

4.5.1 Evaluation of the Research Data Analysis from the Perspective of Added Value (Stage 1 Evaluation)

To determine what are the added value, new, generic and indicatives that can be attained from this research, the results of research data analysis and research validation will be evaluated against the latest and to date relevant literature that have been covered in chapter 2 of this thesis. The added value shall cover all of the stages of the audit. The results of this evaluation are explained in section 6.4.

4.5.2 Evaluation of Research Data (RD) and Auditing Framework (Stage 2 Evaluation)

The outcome of this research study and the effectiveness of the proposed PAF will be evaluated through the following steps:

- Evaluation with regard to the metrics of audit performance measurements that will be developed by the researcher and participants during the stage of management review (MR). The result of this evaluation is explained subsequently in section 7.2.1.
- Evaluation with regard to realizing the research objectives. The result of this evaluation is explained subsequently in section 7.2.2.
- Evaluation with regard to answering the research questions. The result of this evaluation is explained subsequently in 7.2.3.

Finally, the methods that will be applied for the research data analysis, validation and evaluation are illustrated in the Table 4.4.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Method</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis Methods</td>
<td>1- Interpretation of audits and research data during the stage of data collection. 2- Contents analysis by themes and coding. 3- Analysis from the perspective of risk management.</td>
<td>It is qualitative research.</td>
</tr>
<tr>
<td>Validation Methods</td>
<td>1- Triangulation. 2- Testing the feasibility, usability and utility of the auditing framework (Platts 1993).</td>
<td>1- They can be used during the stage of data collection by formulating some questions in the PAF from its criteria.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- They can be used during the stage of data analysis by evaluating the audit evidence and audit findings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3- They have been found appropriate with this research methodology about interviewing the participants by both direct and indirect questioning (where answers could be cross checked) are followed.</td>
</tr>
<tr>
<td>Evaluation Method (Stage 1)</td>
<td>1- Evaluation of the research data analysis from the perspective of added value.</td>
<td>1- To determine the contribution of this research to the body of knowledge and practice.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2- To revise the PAF to its final version.</td>
</tr>
<tr>
<td>Evaluation Methods (Stage 2)</td>
<td>1- Evaluation with regard to the approved PM metrics of audit. 2- Evaluation in terms of realizing the research objectives. 3- Evaluation in terms of answering the research questions.</td>
<td>To guide the conclusion of this research study.</td>
</tr>
</tbody>
</table>

Table 4.4: Methods of Analysis, Validation and Evaluation. Source: The author
After completing the data analysis, validation and stage 1 evaluation by the methods that are mentioned in Table 4.4 above, the PAF will be revised and shortened to be limited to the questions and guides that led to the discovery of the factual/chronic/systematic audit’s findings, and to prediction of critical risk’s consequences, in terms of the audit’s pillars of conformance, performance, risk management and improvement.

The stage 2 evaluation by the methods that are mentioned in Table 4.4 above will be applied to guide the conclusion of this research study.

4.6 Practical Work Plan

The practical work plan is explained in section 5.1 and Fig. 5.1 of Chapter 5.
Chapter 5  Data Collection

In this chapter, the stages of development, testing and validation of the proposed auditing framework will be explained.

As identified earlier at the beginning of chapter 4, the methods of data collection in this research study consist of the three phases; 1) review of previous internal audit results, 2) performing eleven audits of the selected participants and 3) focus group by management review meeting and workshops. This chapter describes the results of phase 1 and phase 2 which include the following issues:

Phase 1: Documentation Review of the results of the previous internal audits, and certification audit of 2016.

Phase 2: The results of the audits that are performed in this research study, they include the results of stage 1 audits (self-auditing) and results of stage 2 audits.

These results include the audit findings, their causes and their interpretations.

Phase 3 of data collection methods (focus group by management review and workshops) will be explained in chapter 6, because these methods have also been used in data analysis, in addition to their use in data collection.

The structure of this chapter is as follows:

Section 5.1 illustrates the stages of data collection and data analysis.

Section 5.2 discusses and explains the approach used to develop the preliminary auditing framework (PAF).

Section 5.3 explains the practical work program.

Sections 5.4 and 5.5 explains how the audit results and their causes of this case study are determined and categorized.

Section 5.6 illustrates the results of phase 1 and phase 2 of the practical work, which include the results of; previous internal audits, stage 1 and stage 2 audits of this study, with their cause and interpretation.
Therefore, this chapter also aims to accomplish the first part of RO 3 (to determine a way of auditing that would enable the organizations to audit of conformance, performance, improvement and risk management collectively and effectively).

5.1 Phases and Methods of Data Collection and Data Analysis

The first stage of data collection was the literature review (LR). The strategies, techniques and ways of LR that have been followed in this research study can be summarized as follows:

- Reviewing the evolution and development of Performance measurement models, and the quality-related business excellence models.
- Determining the advantages and limitation of the most well-known performance measurement models, particularly the quality-related business excellence models and quality audits.
- Reviewing the previous experience from the implementers of quality related BEMs with regard to converting concepts and principles into practice and to the development of the frameworks.
- Focusing attention of the quality auditing that represents the main body of this study.
- Review the standards and guidelines that are related to quality auditing, such as the ISO 9001:2015 Standard and ISO 19011:2011 and 2018 Guidelines.
- Review the applicability of implementing the ISO Standards through their principles and concepts.
- Reviewing the enhancements that were previously recommended by the previous associated authors to learn from them and to avoid repeating their work.
- Performing LR on every single word that form the title of this study, such as framework, integration, ISO 9001:2015 principles.

The phases of practical work with regard to data collection and data analysis are shown in Fig. 5.1. The data analysis in this research starts in parallel with the data collection.
LR and gap analysis to determine the research aim, ROs, RQs and the most appropriate management tools that are consistent with ISO 9001:2015 QMPs and that can be integrated within auditing.

**CAF**

Review the CAF against the practical needs of the selected organization.

- **PAF**

Review of the previous internal audits and categorizing them into NCs, risks and/or OFI (Audit findings).

- Testing and validating the PAF by performing 11 audits, 2 MRM s and 3.

- Determination of audit evidence and then the audit findings (AFs) in the form of NC, risk and/or OFI. Determination of the causes of each finding by applying of the appropriate tools.

Collection and preliminary analysis of AFs in combination with their causes by: 1) coding the AFs and 2) taking into account the view of other department managers (focus group by MRM).

- Qualitative analysis of audits data and MR outputs (research data) by themes to determine their relationships.

- Analyzing the research data from the perspective of risks.

- Review the results of DA against ROs to develop measurement metrics for PM of the audits and the PAF of this cases study.

- Performing three workshops to validate the result of research data analysis and the PAF by Platts (1993) method.

- Evaluation of the research from the perspective of added value.

- Evaluation of the PAF against analysis result, RQs, ROs and agreed metrics, prior to being revised to its final version.

**Fig. 5.1: Stages of Data Collection and Data Analysis. Source: The author**
5.2 Development of A Preliminary Auditing Framework

In response to the audit limitations and the enhancements that are reported in the literature, a CAF was developed. Taking into account the results of the previously approved documentation review, complaints and practical needs of the selected organization (GMRA), a PAF was developed based on the CAF. The stages of PAF development were shown earlier in Fig. 2.9.

This PAF is a mix between audit checklist and guidelines. The checklist was developed by inserting open-ended interview questions that can be used to collect information, justification and conclusion during audit. The guideline was involved by adding the information that might be needed for the auditees to conduct the self-auditing (stage 1 audit). Self-auditing (stage 1 audits) are to be conducted by the auditees (participants) at their departments for the purposes that have already been mentioned earlier in the end of section 2.3.1.5.

This PAF includes the questions and guidelines that reflect the seven QMPs of ISO 9001:2015 and their related management tools which have already been determined in the proposed CAF (Table 2.6). The contents of the PAF are shown in Appendix 1.

This PAF was thoroughly tested and validated by further mixed methods study that are shown in section 5.3, which include eleven internal audits, two management reviews and three workshops.

After completing the practical work that is explained in section 5.3, the PAF is shortened to be limited to the questions and guides that led to the discovery of factual/chronic/systematic audit’s findings in terms of the audit’s pillars of conformance, performance, risk management and improvement.

This PAF is revised to its final version after completion of the phase of data analysis. The last version of the proposed auditing framework is shown in Table 6.10.

5.3 The Practical Work

The PAF was used as an audit tool to conduct the audits of this case study. It also reflects the audit criteria which consist of the seven QMPs of ISO 9001:2015 Standard. Eleven audits were performed at the five departments that were selected based on the justification identified in section 3.9. The frequencies of these audits were as follows:
- Two audits were conducted at the Pipeline Inspection Techniques Department (PIT).
- Two audits were conducted at the Corrosion Protection Department (CP).
- Two audits were conducted at the Operation and Maintenance Department (O and M).
- Two audits were conducted at the Technical Affair Department (TAD).
- Two audits were conducted at the Safety Department (SAD).

Each department (participant) was audited two times, the first audit was in the form of self-audit (stage 1) and the second one was the main audit (stage 2 audit). Stage 1 audits were conducted by the auditees (participants) by the form of self-auditing, using the audit tool of the PAF. All of stage 2 audits were conducted by the author of this research at the selected five departments, using the same audit tool (PAF).

Thereafter, all of the five departments (participants) were audited in combination by the author of this research. This last audit is termed AIC or audit number 11.

Prior to starting stage 1 audits, the PAF was submitted to the auditees for the purpose of performing self-auditing at their departments prior to conduct the main audit.

Each participant (auditee), in order to prepare for stage 2 audit, he was required to; 1) conduct self-auditing at his department; 2) answer the questions of the PAF and support his answers by samples of audit evidence; and 3) submit his answers and replies to the author of this research. Subsequently, this author collected, reviewed, corroborated and validated these answers and replies with their audit evidences to determine the audit findings. The effectiveness of stage 1 audits is verified by the volume of audit evidence investigated and by the significance and materiality of audit findings discovered.

After that, stage 2 audits were conducted by the auditor at the auditee's premises of the selected five departments. During this stage, the auditor interviewed the auditees, audited further samples and reviewed additional audit evidence beyond that which had already been reviewed during stage 1 audits. The effectiveness of stage 2 audits is verified by the volume of audit evidence investigated and by the significance and materiality of audit findings discovered.
The audit findings were determined and categorized into non conformities (NCs), risks and opportunities for improvement (OFIs) and then they were presented at the management review meeting (MRM) for validation by further relevant participants (managers of the other departments) who might affect or be affected by these audit findings. The output of this MRM was then presented to workshops for further validation.

The practical work was performed in accordance to the program that is shown below in Tables 5.1, 5.2 and 5.3.

### 5.3.1 The Program of the Practical Work by Audits

Eleven audits were conducted during the period of 30/04/2017 - 5/06/2017, as shown in the following program.

<table>
<thead>
<tr>
<th>Auditee</th>
<th>Audit number</th>
<th>Date of handing over of the audit framework</th>
<th>Period of stage 1 audit</th>
<th>Date of meeting to agree on audit findings</th>
<th>Date of stage 2 audit</th>
<th>Date of closing meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIT</td>
<td>1 and 2</td>
<td>30/04/17</td>
<td>1 Week</td>
<td>07/05/17</td>
<td>14/05/17</td>
<td>16/05/17</td>
</tr>
<tr>
<td>CP</td>
<td>3 and 3</td>
<td>30/04/17</td>
<td>1 Week</td>
<td>08/05/17</td>
<td>17/05/17</td>
<td>20/05/17</td>
</tr>
<tr>
<td>O &amp; M</td>
<td>5 and 6</td>
<td>30/04/17</td>
<td>1 Week</td>
<td>09/05/17</td>
<td>21/05/17</td>
<td>23/05/17</td>
</tr>
<tr>
<td>TAD</td>
<td>7 and 8</td>
<td>30/04/17</td>
<td>1 Week</td>
<td>10/05/17</td>
<td>24/05/17</td>
<td>27/05/17</td>
</tr>
<tr>
<td>SAD</td>
<td>9 and 10</td>
<td>30/04/17</td>
<td>1 Week</td>
<td>11/05/17</td>
<td>28/05/17</td>
<td>30/05/17</td>
</tr>
<tr>
<td>AIC</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td>3-4 /06/17</td>
<td>5/06/17</td>
</tr>
</tbody>
</table>

Table 5.1: Audits Program. Source: The author

The audit evidence of stage 1 audits (self-auditing) and stage 2 audits were assembled, corroborated, verified, validated and evaluated, in order to determine the audit findings. Thereafter, the audit findings were collected with the findings of the previous internal audits and all were interpreted according to the criteria of Clauses number 9.1.1.d, 9.3.2. c, d, e and f of ISO 9001:2015 Standard, which require organizations to verify the effectiveness of internal audits to address NCs, risks and opportunities. The result of this interpretation was presented in the management review meeting for further analysis.
5.3.2 The Program of the Practical Work by Focus Group

Five focus group interviews were conducted in the form of two management review meetings (MRM) and three workshops (WS), as shown in Table 5.2.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Who Involved</th>
<th>Date</th>
<th>Aim</th>
</tr>
</thead>
</table>
| MRM Part 1 | All Department managers including the 5 auditees (participants)               | 7-8 /06/17 | - Validation of audit results and determination of further audit findings.  
- Comments on the result of audit data’s interpretation that was presented by the author.  
- Comment on audit data analysis criteria, which are proposed by the author. |
| MRM Part 2 | Same as above                                                                 | 14-15/06/17| - Comment on the result of data analysis, which covered the results of audits and MRM Part 1.  
- Involving in development of evaluation metrics for the audits and auditing framework. |
| WS Part 1  | 5 auditees and 5 internal auditors                                            | 18/06/17  | - Validation and Evaluation of the results of data analysis.                                                                                                                                         |
| WS Part 2  | Same as above                                                                 | 22/06/17  | - Comment on the preliminary auditing framework and propose changes.                                                                                                                                |
| WS Part 3  | Same as above                                                                 | 14/8/2017 | - Comment and follow up of the action required by the above activities.                                                                                                                             |

Table 5.2: Focus Group Program. Source: The author

5.3.3 The Practical Program by Presentations

In order to complete the programs of Tables 5.1 and 5.2 successfully, the awareness of participants to the relevant topics was promoted by the following presentations.

<table>
<thead>
<tr>
<th>Title of the presentation</th>
<th>Date</th>
<th>Aim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose of the research and framework’s instructions.</td>
<td>23/4/2017</td>
<td>To enable the auditees to conduct the self-auditing (stage 1 audit) successfully.</td>
</tr>
<tr>
<td>Problem definition tools (4Ws, 2Hs, 1C).</td>
<td>24/4/2017</td>
<td>To enable the auditees to define the audit evidences and findings correctly and accurately.</td>
</tr>
<tr>
<td>Problem solving tools (RCA, 5Ms and 5Whys).</td>
<td>1/6/2017</td>
<td>To enable the auditees to be involved in identification of the causes of problems and risks correctly and accurately.</td>
</tr>
<tr>
<td>Clarification on PAF changes and follow up.</td>
<td>13/8/2017</td>
<td>To explain the details of the PAF and to help the participants to understand its contents correctly and accurately.</td>
</tr>
</tbody>
</table>

Table 5.3: Presentations Program. Source: The author
The above training program was conducted for the following purposes:
- To ensure conducting stage 1 audits by the auditees correctly.
- To improve the communication between the researcher and participants during the above practical work program, which includes audits, MRMs and workshops.
- To verify the deep understanding of audit questions, answers, evidence and findings by all participants.
- To enable the participants to be involved in data analysis.
- To facilitate integrating the tool of coaching.

Since the results of the practical work of the audits will need to be subjected to analysis, it was important to verify the validity of this analysis. To avoid analyzing of inappropriate data, the accuracy, correctness and validity of the audits findings of this research study audits were verified and validated by applying the following procedures.

5.4 The Procedure for Determination of audit findings.

Clause 3.4 of the ISO 19011:2011 Guidelines defined the audit findings as “the results of the evaluation of the collected audit evidence against audit criteria”. In general, audit findings may indicate conformities or non conformities (NCs) or may lead to the identification of risk or opportunities for improvement (OFI). However, in reaction to the Problem Identification and Rationale identified earlier in section 1.2 and with reference to Coleman (2013) who determined the three pillars of auditing in compliance, risk management and improvement, the audit findings in this case study were categorized into NC, risk or OFI, based on the following definitions.

i Anon conformity (NC) was issued to cover the audit of compliance (conformance), performance, and improvement in such cases:

- When the requirement is not followed (non fulfillment of a requirement).
- When the requirement related to an intended or specified use is not followed.
- When the requirement is implemented, but the planned objectives and desired results are not achieved.
- When the requirement is implemented, but the planned or expected improvement is not achieved.
ii A Risk was issued to cover the audit of risk management in such cases:
   - Combination of the probability of occurrence of harm and the severity of that harm (ISO 14971:2007).

iii An OFI was when there is a need to suggest an improvement in the quality management system of the audited department as a whole or in particular processes.

The categorization of audit findings in this research study is shown in Fig. 5.2.

![Fig. 5.2: Forms of Audit Findings. Source: The author](image)

To assure the reliability and validity of these audit findings (NCs, risks and OFI), the auditor focused only on;

- Factual NCs, risks and OFI: which were based on a verifiable fact for which there was no doubt to these types of audit evidence.
- The NCs, risks and OFI that affect the integrity and reliability of the main core of organizational product (pipeline and infrastructures) and also process effectiveness (major).

The minor NCs were not examined in this research study. Remembering that the NC is categorized minor when it is not likely to result in the failure of the quality system or reduce its ability to assure controlled processes or products (PECB, 2016).

- The NCs, risks and OFI that were repeated throughout all of the five audited departments (Systematic) and those found to be repeated over time at each one of the five audited departments (Chronic).
- The NCs, risks and OFI that were raised as a result of corroboration and validation of audit evidence.

- The NCs, risks and OFI that were agreed and confirmed by all auditees who participated in audit number 11 (AIC) and agreed by all department managers who attended part 1 of the management review meeting.

- The NCs, risks and OFI that were found at some of the five audited departments (not all) and that happened perchance have been overlooked, because they were not systematic, nor chronic.

Therefore, the AFs that were examined in this research study are in the form of the types shown in Fig. 5.3.

![Fig. 5.3: Types of Audit Findings. Source: The author](image)

The causes of these NCs, risks and OFI have been determined by the auditor (the researcher) and auditees in accordance to the following procedure.

**5.5 The Procedure of Determination of Audit Finding’s Root Causes**

Generally, the identification of problems/risks and their root causes is for the purpose of taking an immediate corrective action and citing action to correct a similar occurrence. As a result, the validity, correctness and accuracy of the definitions of the discovered problems and their root causes were verified by involving the auditor in this determination and by applying the appropriate management tools that are shown in Fig. 5.4 and Table 5.4.
The above management tools were applied at the audit phases shown in Table 5.4.

<table>
<thead>
<tr>
<th>Management Tool</th>
<th>Applied at the audit phase of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem definitions by 4Ws, 2Hs, 1C (What, Where, When, Who, How much, How often and what Consequences).</td>
<td>- Triangulation and corrobororation of audits evidences to transform them into audit findings.</td>
</tr>
<tr>
<td></td>
<td>- Determination and categorization of audit findings into NCs, risks and OFI.</td>
</tr>
<tr>
<td></td>
<td>- Determination of materiality of audit findings.</td>
</tr>
<tr>
<td>The 5Ms, 5Whys and RCA</td>
<td>- Determination of the root cause of each NC and risk.</td>
</tr>
</tbody>
</table>

Table 5.4: Management tools interrelated to Problems definition and solving. Source: The author

The plurality of the problem solving tools was for the purpose of validation. Each root cause of each non conformity was determined by applying RCA and validated by applying 5Whys. RCA was applied by both auditor (researcher) and auditees during stage 1 and stage 2 audits to
determine the causes of the discovered NCs and risks. The 5Whys tool was only applied on 5 NCs of stage 1 audits and 8 NCs of stage 2 audits to confirm the accuracy of causes that were determined by RCA. The 5Ms was applied to determine the type of each cause.

By applying the 5Ms and RCA collectively, the determined causes were divided into Human (Manpower), Organizational (System, Method, Measures, Software and Procedures) and/or Physical (Machine, Materials and structure).

![Fig. 5.5: Categorization of Causes by their Types. Source: The author](image)

To facilitate more effective audits and for further validation of the case study audit findings and their root causes, the auditor has taken advantage of existing results of the previous internal audits (2016) and the last certification audit (2016) that were reported in GMRA (2016). These results were reviewed and considered during the stage of data analysis.

5.6 Results

5.6.1 Results of previous internal audits and certification audit (2016)

With reference to GMRA MR Report of 2016 (GMRA, 2016) it is revealed that the previous internal audits of 2016 resulted in a determination of 28 AFs and the last certification audit resulted in a determination of 4 AFs, as shown in Appendices 2 and 3 respectively. All of these AFs were classified as NCs. The causes of all these NCs have not been documented by GMRA.

The review of the results of previous internal audits (Appendix 2) and the result of the previous certification audit (Appendix 3) revealed that:

- All of these audit findings were limited to the NCs (total 32) and do not include any risks or OFI. In accordance to the NCs categorization that was described in Fig. 5.3, all of
these 32 NCs were categorized factual. Only 9 NCs out of a total of 32 were classified as chronic and systematic, they are the NCs numbers; 1, 2, 3, 5, 6, 10, 13, 16 and 19 of Appendix 2.

- All causes of these 32 NCs were categorized to be documentation violation. These causes are shown in Table 5.5.

<table>
<thead>
<tr>
<th>Result and causes</th>
<th>Total Non conformities</th>
<th>Non conformities raised during internal audits</th>
<th>Non conformities raised by the certification body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results</td>
<td>32</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>Causes</td>
<td>Documentation violation</td>
<td>Documentation violation</td>
<td>Documentation violation</td>
</tr>
</tbody>
</table>

Table 5.5: Causes of previous internal audits and certification audit. Source: The author

5.6.2 Results of stage 1 audits (self-auditing)

The outputs of stage 1 audits (self-auditing) were determined initially in the form of audit evidence and then they were subjected to assembly, corroboration, verification, validation and evaluation to determine the audit findings in the form of NCs, risks and/or OFI, as shown in Appendix 4.

The cause of each audit finding was determined in accordance to the criteria that was explained above in Fig. 5.5. The review of these AFs and their causes resulted in determining the following interpretations:

- NCs number 7, 8, 9, 12, 14, 15, 16, 17, 18, 19, 20, 22 represent risk identification (12 out of a total of 24). This means that 50% of NCs are categorized as risks.
- 15 causes are Organizational.
- 5 causes are Human.
- 3 causes are Organizational and Human.
- 1 cause is Physical.

By considering the overlaps, these causes can be represented as follows:
- Organizational causes were noted on a total of 20 AFs= 83%
- Human causes were noted on a total of 10 AFs = 41%
- Physical cause was noted on one AF = 4%

5.6.3 Results of stage 2 audits

The audit findings of stage 2 audits and their causes were determined in accordance to the same procedure that was applied during stage 1 audit. However, it is verified that there is neither publication nor repetition between stage 2 audit findings (AFs) and stage 1 audit findings (AFs).

The AFs of stage 2 audits were also validated during audit number 11 (AIC), which was conducted with all of the five department managers in combination.

The results of stage 2 audits are identified in Appendix 5. It includes the NCs, risks and OFI and their causes. The review of these AFs and causes resulted in determining the following interpretations:

- The NCs number, 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 27, 28, 29, 31, 32 and 36 are related risk identification. They are 22 out of a total of 46 (48%)
- 21 causes are Organizational and Human.
- 10 causes are Organizational.
- 8 causes are Human.
- 3 causes are Physical.
- 3 causes are Human and Physical.

By considering the overlaps, these causes can be represented as follows:

- Organizational causes were noted on a total of 32 AFs = 69%
- Human causes were noted on a total of 33 AFs = 71%
- Physical causes were noted on a total of 6 AFs = 13%

The author of this research study believes that knowing the proportions, percentages, natures and types of the discovered AFs and their causes has a significant impact on how these data are analyzed. Also, it shows the effectiveness of each stage of audits and the reasons for the
difference and contrast between these stages (previous internal audits, stage 1 audits and stage 2 audits).

Prior to analyzing the audit findings of stage 1 and stage 2 audits and their causes (Appendices 4 and 5) and to ensure that this analysis is comprehensive and covers all relevant and appropriate data, it was significant to consider the results of the previous internal audits and certification audit that were identified in Appendices 2 and 3 respectively. The result of this analysis is reported in Chapter 6.

The data which has been collected in this chapter is recorded in the following appendices:

- Appendix 2: Results of previous internal audits.
- Appendix 3: Results of previous certification audit.
- Appendix 4: Results of stage 1 audits of this case study (Self-auditing).
- Appendix 5: Results of stage 2 audits of this case study.

Thereafter, these results were subjected to qualitative analysis, as explained in the next chapter.
Chapter 6: Data Analysis

6 Discussion and Data Analysis

This chapter aims to complete the accomplishment of the third and fourth research objectives. It explains the approach used to analyze and validate the research results (output of chapter 5) and the approach used to enhance, validate, evaluate and revise the PAF to its final version. It includes the results of data analysis and validation.

The structure of this chapter is as follows:

Section 6.1 describes the analysis plan that was followed.

Section 6.2 explains the steps and results of data analysis, which are shown in the following subsections:

- Analysis of audit findings by taking into account the view of other department managers (focus group by MRM part 1 ‘group interview’).
- Analysis of audit findings by taking into accounts the causes and effects.
- Analysis of research data (audits data and MR data) by themes (Qualitative Contents Analysis).
- Analysis from the Perspective of risk.
- Development of performance measurement metrics for the audits and PAF of this case study.

Section 6.3 discusses the methods of data validation while Section 6.4 describes the evaluation of the research data analysis from the perspective of added value.

Finally, Section 6.5 provides the structure and contents of the final version of the auditing framework that represents the aim of this research study.

6.1 Analysis Plan

After determination of the audit data of this case study (results of chapter 5), they were coded using a heuristic tool to facilitate discovery and further investigation of the data. These data were collected and categorized based on the comparison and contrast between the following:

1 Findings of previous internal and certification audits of 2016.
2 Findings of stage 1 audits (self-auditing).
3 Findings of stage 2 audits.
4 Findings of management review meetings (focus group number 1).

And then all of audit findings including NCs and risks, including their causes and consequences were categorized and interpreted based on:
1 Effectiveness and efficiency of each audit in detection of systematic, chronic and factual NCs and/or risks.
2 Significance and amount of risks and opportunities identified in each stage of audit.
3 Covering the most important matters and the wide range of samples of the audited process.
4 Types of the causes of the NCs and risk.
5 Types of the consequences of those causes.

Subsequently, the important themes were highlighted and grouped and then the relationships between these themes were explored.

This analysis was conducted in course of the following steps:

6.2 Steps of Data Analysis

6.2.1 Step 1: Preliminary Analysis of Audits Data:

The results of previous internal audits, previous certification audit, stage 1 audits and stage 2 audits (Appendices 2, 3, 4 and 5) were subjected to preliminary analysis. This analysis revealed the following explanations.

1 The effectiveness of stage 1 and stage 2 audits to address risks and prevent/reduce the undesired effects is verified since about 50% of the audit findings were categorized as risk identification. This relied on the following justification:
Stage 1 audits resulted in a determination of 12 risks out of a total of 24 non-conformities. The AFs numbers; 7, 8, 9, 12, 14, 15, 16, 17, 18, 19, 20 and 22 represent risks identification (50% of NCs are categorized as risks).

Stage 2 audits resulted in a determination of 22 risks out of a total of 46 non-conformities. The AFs numbers; 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 27, 28, 29, 31, 32 and 36 are related to risk identification (48% of NCs are risks).

Therefore, the total results of stage 1 and stage 2 audits revealed that they were effective in identification of 34 risks out of a total of 70 AFs (49%).

The effectiveness of stage 1 and stage 2 audits for covering the most important matters were verified, because 100% of the discovered 70 AFs were systematic, chronic and factual, and they are related to the core business processes. In contrast with the previous internal audits that resulted in discovering of just 9 chronic, systematic and factual AFs out of a total of 28, which represent 34%.

The effectiveness of stage 1 audit (self-auditing) to help the auditor of stage 2 audits to focus on the most important matters and determine the inherent risk was also verified. This is relied on explanation number 1 of this section (6.2.1), which shows that the discovery of 24 AFs during stage 1 audit led up to discovery of further 46 AFs during stage 2 audit and 50% of these 46 AFs were about risk identification.

The causes of AFs were mostly related to organizational (system) and Human (Manpower), as summarized in Table 6.1:
<table>
<thead>
<tr>
<th>Stage 1 audits</th>
<th>Stage 2 audits</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of AFs Causes = 24</td>
<td>Total number of AFs Causes = 46</td>
<td>70</td>
</tr>
<tr>
<td>Organizational causes = 20 = 83%</td>
<td>Organizational causes = 32 = 69%</td>
<td>The total causes that are related to organizational system were 52 out of a total of 70 = 74%</td>
</tr>
<tr>
<td>Human causes = 10 = 41%</td>
<td>Human causes = 33 = 71%</td>
<td>The total causes that are related to staff competency were 43 out of a total of 70 = 61%</td>
</tr>
<tr>
<td>Physical causes = 1 = 4%</td>
<td>Physical causes = 5 = 13%</td>
<td>The total causes that are related to technology were 6 out of a total of 70 = 8%</td>
</tr>
<tr>
<td>Organizational and Human causes collectively = 3 = 13%</td>
<td>Organizational and Human = 22 = 48%</td>
<td>The total causes that are related to organizational system and staff competency in combination were 25 out 70 = 36%</td>
</tr>
<tr>
<td>Human and physical causes collectively= 0 = 0%</td>
<td>Human and physical =3 = .04 %</td>
<td>The total causes that are related to technology and staff competency in combination were 3 out of a total of 70 = .04 %</td>
</tr>
<tr>
<td>Organizational and physical causes collectively = 0 =0%</td>
<td>Organizational and physical = 0 = 0 %</td>
<td>The total causes that are related to organizational system and technology in combination were 0 out of a total of 70 = 0 %</td>
</tr>
</tbody>
</table>

Table 6.1: Types and statistics of causes. Source: The author

It is noted that some of the organizational causes were related to the unavailability of risk management framework and none of the organizational procedures require the application of management tools. It is also noted that most of the human causes were related to the insufficient awareness among internal auditors and department managers of the management tools.
Most AFs and their causes were discovered as a result of audit number 11, which was conducted at the five departments in combination (AIC) after completion of stage 2 audit at each department.

The group interview by auditing of the five departments in combination was effective in identifying and addressing of the types of consequences of the risks identified. The auditor and auditees have successfully determined the types of consequences for 19 risks out of a total of 22 risks of stage 2 audits. Herein are the types of consequences which have been identified and categorized as high severity and high probability.

<table>
<thead>
<tr>
<th>AF serial number of stage 2 audit, that identified risks</th>
<th>Their Types of Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, 5, 6, 8, 27, 28, 29, 36 (total 10 AFs)</td>
<td>Technical failures, like pipeline failure due to consuming of corrosion protection sacrificial zinc anodes.</td>
</tr>
<tr>
<td>1, 2, 3, 5, 6, 8, 13, 14, 15, 16, 17, 18, 27, 28, 29 and 36 (total 16 AFs)</td>
<td>Failure in technology, like lack of efficiency of the acoustic monitoring techniques that are used for monitoring of pipeline integrity.</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 9, 13 and 36 (total 8 AFs)</td>
<td>Problems in overall system, like loss of control in many processes including the process of performance measure and process of internal audits.</td>
</tr>
<tr>
<td>1, 2, 3, 5, 8, 13, 27, 28, 29 and 36 (total 10 AFs)</td>
<td>Breakdown of some of project permanent equipment like, water wells pumps, degassing plants, water treatment plants, pressure relief valves, butterfly valves, header tanks, water balancing reservoirs, telecommunication system, air evacuation units, electric generators, etc., due to shortage of spare parts and shortage of budget.</td>
</tr>
<tr>
<td>5, 7 and 36 (total 3 AFs)</td>
<td>Financial crises and termination of cash flow that was routinely provided by the government.</td>
</tr>
<tr>
<td>6, 7, 14, 15, 16, 17, 18 and 36 (total 8 AFs)</td>
<td>Economic crises, due to loss of customers who buy and utilize GMRA water.</td>
</tr>
</tbody>
</table>

Table 6.2: Types of Risk’s Consequences Identified During Audits. Source: The author
The above results (Table 6.2) illustrated that most types of risk consequences are interrelated to technical and technological failures (physical), and they were categorized critical, because they are related to the main product of the audited processes (pipeline integrity) and they might lead to crisis or disaster if no preventive actions are taken to prevent the occurrence of these consequences.

By comparing these consequences with the research rationale (Section 1.2), it is revealed that the audits of this case study were effective in responding to complaint ‘b’ of section 1.2, which states; “The audits have failed to identify many warning indicators with regards to technical failure”.

7 The previous internal audits and certification audit have failed to determine any significant risks and/or threats.

8 The internal auditors and certification auditor did not focus on what is important. They mostly focused on conformance rather than performance, and most of their findings were related to MS document violation.

9 All non conformities raised as a result of stage 1 audit (self-auditing) and stage 2 audits were validated during the audit number 11 that was performed on all five departments in combination, in which the tools of documentation review, individual interview and group interviews were applied.

10 With reference to the procedure that was explained above in section 5.5 and Fig. 5.4, it is revealed that the involvement of auditor in a determination of the NCs root causes and the use of the relevant management tools helped in determination of the correct and accurate causes. This interpretation was agreed by all five auditees.

11 Performing the research audits in two stages helped the auditor of stage 2 audits to audit wider scope than previous internal audits and review more representative samples. This was in relation to the volume of audit evidence and significance audit findings.

12 None of the previous GMRA internal auditors predicted for any of failures taken place. On the other hand, the audits of this research study succeeded in prediction of some technical and technological failures, as shown in Table 6.2.
All of the audit findings, including their causes and the above explanations (from 1 to 12) were presented by the researcher to the management review meeting (MRM) in order to conduct further data collection and data analysis, as explained in the flowchart (Fig. 5.1). The results of this MRM were as follows:

6.2.2 Step 2: Analysis of audit findings by taking into account the view of other department managers (focus group by management review meeting– part 1 ‘group interview’)

The aim of this MRM was to get the view of other department managers, who were called to comment, corroborate, confirm, validate and evaluate: 1) the results of audits (stage 1 audits, stage 2 audits, previous internal audits and certification audit), 2) the root causes that were determined by author and agreed by auditees, 3) the above explanations (1-12 of section 6.2.1) that were determined by the auditor (researcher) and 4) whether the proposed auditing framework did provide a practical performance measure guide for internal audits of the selected organization.

This meeting was structured according to the following three main steps:

a Overall presentation provided by the researcher on the audit results and explanations with the necessary background of the research.

b Overall presentation provided by the five auditees with the explanation of the adequacy of the proposed framework to undertake the stage 1 audits (self-auditing) and stage 2 audits.

c Discussion about audit evidences, audit findings, causes, consequences, effects, analysis, correction, corrective action, preventive action, risks, threats, opportunities of improvements, and proposal of new practices.

This meeting was conducted over two days and it is resulted in the following analysis.

i Analysis of audit findings in combination

The analysis of all audit results including the previous internal audits, stage 1 audits and stage 2 audits revealed that the previous internal audits and certification audit were ineffective, inefficient and unproductive, on account of:
a Inherent risk was not properly assessed and evaluated during planning of internal audit program. The internal auditors have not taken into account that the existing quality management system documentation could include significant defects and could miss significant requirements.

b No evidence shown to prove that the internal auditors have adjusted their sampling plan based on the materiality of each process and assets audited.

c Failing to detect a significant defect or risk (detection risks), as they did not include any risks.

d The complexity of technology and design processes were not considered during internal audit program. All departments were treated equally with regard to the number of internal audits and duration of each audit. For example, the department responsible of pipe integrity was treated equally with the department responsible for public relations. Both departments were audited once during 2016.

e The level of vulnerabilities was not covered nor considered at any of audited processes. The internal auditors have not considered the significance of the audited departments or processes with regard to its effect or impact of the organization’s function. For example, none of the 28 NCs detected during internal audits of 2016 was related to the pipeline integrity, which has already experienced different kinds of failures.

f GMRA organization and its certification body have not used PM techniques as much as experts believe to be useful, and they rationalized this lack by reporting that the ISO 9001 elements (main audit criterion) do not explicitly requested this use.

The above 6 points (from a to f) concentrate on the main causes of the 28 AFs of the previous internal audits (2016) including the nine systematic chronic NCs. These causes were found to be related to organizational MS documentation.

In comparing the results of stage 1 audits and stage 2 audits with the results of the previous internal audits, it is revealed that the competency and performance of previous internal auditors and certification auditors need improvement for the reasons below:
- No evidence affirmed to show that they have focused and validated the accuracy of information provided by auditee.

- No evidence affirmed that they have sufficient experience, background and knowledge in the process they audited. For example, internal auditor with an HR background has audited technical department.

- No evidence provided to show that the certification auditors have evaluated if the work of internal auditors was properly planned, supervised, reviewed and documented and to what extent.

- No evidence provided to show that the certification auditors have evaluated the amount of judgment involved in performing the internal audit procedure, obtaining evidence, assessing risks, determination the objectively and competence of the internal auditors.

The above 4 points addressed that the main causes are related to internal auditors and certification auditors’ competency. These causes were also determined after involving of more participants in the MRM.

ii Analysis of audit findings by taking into account the causes and effects

The attendees of the MRM agreed with the following inferences that were presented by the researcher:

- The process complexity was not part of GMRA MS documentation and the materiality of the management system was not determined. All departments are treated equally with respect to internal auditing, employee’s motivation and training. No priority matrix has been established.

- The previous GMRA management review focused only on MS suitability, adequacy and effectiveness, but did not include any assessing of risks, opportunities for improvement and new practices.

- Involvement of an auditor in conjunction with auditee in a determination of NCs causes helped in a determination of correct and valid corrective action. Therefore, the value of the auditor as a problem solver is demonstrated.
The auditees and participants acknowledged that their awareness of the audit tools and management techniques was improved as a result of this case study audits. Therefore, the value of auditor as a coach for the auditee is demonstrated.

The attendees of part 1 of the MRM recommended to the top management to look for some of the opportunities that would lead to the adoption of new practices, launching new products, opening new markets, addressing new clients, building partnerships, using new technology and other desirable and viable possibilities to address the organization’s or its customers’ needs are discussed. The following recommendations were agreed:

a. Searching for new markets and new clients: Selling the knowledge and know-how by focusing on partnerships with companies specializing in water industry, project management and construction.

b. Share the projects with the beneficiary Municipalities.

It was agreed to authorize the researcher to conduct further analysis of the research data by themes and present it to part 2 of the management review meeting, in order to validate its analysis result and develop the metrics for internal audit performance.

6.2.3 Step 3: Qualitative analysis of research data (audits data and MR data) by themes

The audit results (Appendices 2, 3, 4 and 5) and the outputs of the above analysis (Sections 6.2.1 and 6.2.2) were thematically organized by topics, context and consequences and hence, they were interpreted to look for patterns, paradoxes and relationships within and between these different themes.

During the stages of audit data collection and preliminary analysis, seven themes have emerged. They are: Self-auditing, Audit, Audit’s samples, NCs, Risks, Causes, Consequences and OFI. During the stage of management review, it was agreed to disregard the them (OFI) because none of the audits resulted in issue of OFI, and then the attendees confirmed the importance of these themes and one more item emerged, which is: ‘The process complexity and MS materiality’.
It should be noted that all of the agreed eight themes have already been covered by the LR (Chapter 2), as they were parts of the topics addressed.

In this section, each of the eight themes in turn is considered, to draw out the aspects of each that the auditor believes are important for auditing performance, effectiveness and efficiency.

The interrelation and links between these eight themes are shown in the following Table 6.3.
<table>
<thead>
<tr>
<th>Theme</th>
<th>Its definition in this case study</th>
<th>Relationship with</th>
</tr>
</thead>
</table>
| 1- Self-auditing (stage 1 audit) | Audit conducted by each participant at his department, based on the criterion of the PAF.          | - Number of samples audited.  
- Significance of audit evidence (Process complexity and MS materiality).  
- Significance of NCs and risks determined (systematic, chronic and factual). |
|                               | - Helping the self-auditor, who is the auditee of stage 2 audit to determine and review wide range of audit samples and audit evidences, and to prepare for stage 2 audit.  
- Helping the auditor of stage 2 audit to focus on the most important matters.  
- Detection of material audit evidence and significance NC, risks and threats. |                                                                                  |
| 2- Audit (stage 2 audit)      | The standard audit conducted by the researcher at the audited departments’ premises based on the criterion of the PAF. | - Same as above.  
- Significance of opportunities for improvement and new practices. |
|                               | - Reviewing more audit samples and determining further audit evidence.  
- Focusing on the most important matters of the audited process.  
- Detection of critical, chronic, systematic and factual NCs and risks.  
- Determination of the root causes of AFs correctly.  
- Determination of the consequences of the determined risks correctly.  
- Addressing opportunities for improvement and new practices during or after the audit.  
- reducing the undesired effect. |                                                                                  |
| 3- Audit samples (audit evidence) | The documents and records examined / activities observed / measurement conducted / people interviewed during the audit. | Process complexity and MS materiality.                                           |
|                               | - Number and significance of documents, records, items reviewed by the auditor and self-auditor.  
- Number and significance of people interviewed during stage 2 audits.  
- Number and significance of activities, processes and products observed and tested during stage 1 and stage 2 audits. |                                                                                  |
### Theme: Non-Conformities (NCs)

**Type 1 of audit findings.** Non fulfillment of the requirements of the seven QMPs and three concepts of ISO 9001:2015 and their related management tools.

- Significance, criticality and type of NC (chronic systematic, factual, major and critical NCs).
- Cost and consequences of NC determined or expected.

**Relationship with:**
- Number and significance of NCs (systematic, chronic and factual).
- Risks and threats.
- NCs and risks consequences.
- Significance of NC (Process complexity and MS materiality).

### Theme: Risks

**Type 2 of audit findings.** A combination of the probability of occurrence of harm and the severity of that harm (ISO 14971:2007). Also, it is the effect of uncertainty on desired results (ISO 9001:2015).

- Effectiveness of audit in the determination of risks and opportunities correctly, accurately and easily.
- Significance and effect of risk determined (risk identification).
- Determination of the consequences, probability, severity and level of each risk (risk analysis).
- Risk evaluation.

**Relationship with:**
- Stages of audit.
- Audit versus risk identification.
- Audit versus risk management.

### Theme: Causes

The reasons that caused the NCs and/or that would lead to NC, risk and threat.

- Defining the problem correctly and accurately prior to determining its causes.
- Determining the main type of causes correctly, accurately and easily (organizational MS, human and/or physical).

**Relationship with:**
- Auditor’s involvement.
- Auditees involvement.
- Use of problem solving tools and determining the most effective tool.
- Audit Stage Vs Causes.
- Effect of each type of cause.
<table>
<thead>
<tr>
<th>Theme</th>
<th>Its definition in this case study</th>
<th>Relationship with:</th>
</tr>
</thead>
<tbody>
<tr>
<td>7- Consequences (Effects)</td>
<td>The effects and outcomes of each NCs, risks and their causes. For example, failures, breakdown and crises predicted.</td>
<td>- Audit stage vs Consequences.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Types of consequences.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Prediction of failures.</td>
</tr>
<tr>
<td></td>
<td>- Determining the type, effect, extent and cost of consequences.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Determining the degree of importance and criticality rating.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Determining the cost and significance of problems predicted like technical failure, equipment breakdown and system failure and financial crises.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Determining the types of consequences (Technical, technological, financial and etc.).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Determining the possibility, probability severity and level of consequences.</td>
<td></td>
</tr>
<tr>
<td>8- Process complexity and MS materiality</td>
<td>Ensure auditing the most important issues by determining:</td>
<td>- Audit Stage Vs process complexity</td>
</tr>
<tr>
<td></td>
<td>- the criticality of the equipment, material and structure operated and managed by the audited department</td>
<td>- Audit Vs Risk assessment of audited process.</td>
</tr>
<tr>
<td></td>
<td>- the complexity of the audited process and is sub-processes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potential cost of errors, risks or non-conformities. The degree of severity resulting from the errors.</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.3: Research themes and their interrelationships. Source: The author.
In order to corroborate and make sense of the manifestation, indicators and relationships of the themes and sub themes identified in Table 6.3, they were displayed in different way to explore further patterns and relationships within the stages of audits and to explore their importance and proportionate with regard to data analysis.

In order to provide more in-depth interpretation for the above relationships (Table 6.3), it was important to determine the frequency and intensity of each relationship based on; 1) their definitions in this case study, and 2) their significance with respect to the stages of audit. Provided that the OFI theme was recalled because it is considered as a one part of the purposes of the audit.

The frequencies were derived from the collected data and measured as follow:

<table>
<thead>
<tr>
<th>Audit stages</th>
<th>NCs</th>
<th>Risks</th>
<th>Causes</th>
<th>Consequences</th>
<th>process complexity, MS materiality</th>
<th>Number of samples verified</th>
<th>Opportunities and new practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous internal audits</td>
<td>low</td>
<td>insignificant</td>
<td>insignificant</td>
<td>insignificant</td>
<td>Insignificant</td>
<td>low</td>
<td>insignificant</td>
</tr>
<tr>
<td>Audit (stage 1)</td>
<td>normal</td>
<td>insignificant</td>
<td>normal</td>
<td>insignificant</td>
<td>normal</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>Audit (stage 2)</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>normal</td>
<td>high</td>
<td>high</td>
<td>normal</td>
</tr>
<tr>
<td>MR</td>
<td>low</td>
<td>normal</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
</tbody>
</table>

* Frequency: repetition rate of such theme at all of the audited five departments.

Legend:
- Insignificant: less than 10% from the grand total.
- Low: less than 30% from the grand total.
- Normal: 30-70% from the grand total.
- High: more than 70% from the grand total

Table 6.4: Themes frequencies. Source: The author
The intensities were derived from the collected data and measured as follow:

<table>
<thead>
<tr>
<th>Audit stages</th>
<th>* Intensity</th>
<th>NCs</th>
<th>Risks</th>
<th>Causes</th>
<th>Consequences</th>
<th>process complexity, MS materiality</th>
<th>Number of verified samples</th>
<th>Opportunities and new practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous internal audits</td>
<td>low</td>
<td>insignificant</td>
<td>insignificant</td>
<td>insignificant</td>
<td>insignificant</td>
<td>low</td>
<td>insignificant</td>
<td></td>
</tr>
<tr>
<td>Audit (stage 1)</td>
<td>normal</td>
<td>insignificant</td>
<td>normal</td>
<td>insignificant</td>
<td>normal</td>
<td>high</td>
<td>low</td>
<td></td>
</tr>
<tr>
<td>Audit (stage 2)</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>normal</td>
<td>high</td>
<td>high</td>
<td>normal</td>
<td></td>
</tr>
<tr>
<td>MR</td>
<td>low</td>
<td>normal</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td></td>
</tr>
</tbody>
</table>

* Intensity: repetition rate of such theme at each of the audited five departments.
Legend:
Insignificant: less than 10% from the total at each department
Low: less than 30% from the total.
Normal: 30-70% from the total.
High: more than 70% from the total.

Table 6.5: Themes intensities. Source: The author

The following relationships have emerged from the above patterns (Tables 6.4 and 6.5):

1. All themes that have been measured by high frequency have also been found to be measured with high intensity and this high measure of such themes indicates that:

   a. Self-auditing helped to increase the volume of samples audited and evidence verified.

   b. Stage 2 audits were more effective than stage 1 audit in identification of risks, causes and process complexity.

   c. The management review was effective for identification of causes, consequences, process complexity, audit samples and opportunities for new practice. Therefore, the preparation of risk management program is realized through MRM.
The measures of all themes with high frequency and high intensity have only been realized by applying stage 1 audits, stage 2 audits and MRM collectively and sequentially.

Auditing the five departments in combination and the involvement of more auditees helped determining the correct causes of risk and NCs. Interviewing more auditees including the owner/operator/customer of the audited process helped in determining the consequences of the detected risks and NCs, but more work would be needed to determine and quantify their probabilities and severities.

Performing self-auditing (stage 1 audit) prior to the main audit (stage 2) helped in the determination of further audits evidences, samples and helped in determination of process complexity.

The Group Interview (like MRM) helped in the determination of important issue, such as OFI, process complexity, MS materiality and coaching.

No OFI were determined during stage 1 and stage 2 audits, but they have only been determined during the MRM. Therefore, it would be recommended for the audits not to be closed out until performing the MR.

Applying some of the problem solving tools and involvement of auditor helped in determination of NCs causes correctly and accurately.

The main causes of most NCs and risks were associated with the limitations in organizational MS documentation and competency of internal auditors.

The Group Interview by the MRM helped in determining the root causes of the NCs of the previous internal audits and certification audits correctly and accurately. Table 6.6 includes the main causes of the audit findings of this case study.
Causes | Limitations of MS Documentation | Non adoption of Risk assessment framework.  
| | | Non adoption of Performance measure tools and techniques.  
| | | Non adoption of self-auditing procedure.  
| | | Ineffective Internal audit procedure.  
| | | Non adoption of ISO 31000 and/or BS EN 31010:2010.  

Limitation of competency of internal auditors and department managers | Non adoption of coaching, despite many talents leaving organization.  
| | Non adoption of training on performance measurement techniques and management tools.  
| | Non adoption of training on self-auditing.  
| | Insufficient awareness of risk assessment techniques BS EN 31010:2010, like the Failure Mode Effect Analysis (FMEA).  
| | Unavailability of risk assessment specialist and risk managers within the organization.

Table 6.6: Sub themes of the ‘Causes’ theme. Source: The author

The Group Interview by the MRM helped in the determination of NCs and risks consequences and found that most of those consequences are physical, as identified in Table 6.7.

| Consequences | Physical consequences | - Failures in pipeline and technologies.  
| | | - Problems in overall system.  
| | | - Breakdown of permanent equipment and structures.  

Table 6.7: Sub themes of ‘Consequences’ theme. Source: The author

Therefore, the audits of this case study helped to predict how each part of the system might fail, but the following issues could not be determined during any of the stages of the audits of this case study.

- The mechanisms that might produce these modes of failure.
- List of any of the failure modes, the failure mechanisms and effects for each component or step of a system or process.

With inference to the above mentioned relationships number 5, 8 and 9, it would be recommended for the audits not to be closed out until performing of the MR. This MR should be considered as a part of the audit, rather than in what is identified in the ISO
9001:2015 Standard, which contextualized both of them respectively but discretely. The clause number 9.2 of ISO 9001:2015 (Internal Audit) is appeared separated from the clause number 9.3 (Management Review).

With regard to the amount and significance of data gained from audit number 11 (AIC) that was conducted at all five departments in combination and to the data that was gained from the MRM, it is concluded that the auditing method by group interview was more effective and more valuable than the auditing by individual interview.

6.2.4 Step 4: Data Analysis from the Perspective of Risk

This way of analysis was adopted to tackle the rationale of this research, which included a complaint indicated that “none of the failures were predicted by any of the previous internal and certification audits” (GMRA, 2014).

Prior to starting this analysis, it is important to note that the risk management (RM) was not audited directly in this case study, because there was no documented program for it in GMRA. However, the RM was integrated into the audit program in accordance to the classification of Coleman (2015b) by tying audit findings’ classification to risk assessment, which is the level 1 audit in terms of auditing of RM.

In order to answer the first part of the RQ4, which stated; can the risk assessment be undertaken during internal audit? And to verify whether the counter measures of these risks could be developed, it was vital to agree with the definition and steps of risk assessment that were identified in the relevant guideline (BS 31010:2010), which defined it as “that part of risk management which provides a structured process that identifies how objectives may be affected and analysis the risk in term of consequences and their probabilities before deciding on whether further treatment is required”.

Therefore, the capability of the audits in this research study to assess the risk is evaluated based on the attempts of their auditing framework to answer the fundamental questions that comprise the components of risk assessment. Hence, it was important to answers to these questions, as shown in the Table 6.8 below:
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What can happen and why (risk identification)?</td>
<td>The risks at the audited processes were identified in general, but the risk of every single component, structure, utility and equipment could not be determined during the time of audit.</td>
</tr>
<tr>
<td>What are the consequences and severities?</td>
<td>General types of consequences were determined after reviewing the audit results during the MRM, but more work will be needed to determine the consequences of every risk for every single component, structure, utility and equipment. This work can be conducted in the form of formal risk assessment.</td>
</tr>
<tr>
<td>What is the probability of their future occurrence?</td>
<td>The probability of each risk consequence was difficult to be determined during the time of audit.</td>
</tr>
<tr>
<td>Are there any factors that mitigate the consequence of the risk or that reduce the probability of the risk?</td>
<td>Once the probability and severity of each risk could not be determined during the time audit, it was difficult to identify how to manage this risk.</td>
</tr>
</tbody>
</table>

Table 6.8: Audits Vs Risk Assessment. Source: The author

With reference to the relationships 2 and 9 of section 6.2.3 and in conjunction with the above criteria (Table 6.8) and in accordance to the definition of BS 31010:2010 in terms of risk assessment, it is concluded that the audits of this case study have facilitated the process of risk identification, which signify the first stage of any risk assessment program. However, the degree of risk assessment at the time of audit is considered incomplete.

For this reason and in the view of this author, further work is recommended to complete the cycle of RM during the time of audit, this cycle includes the assessment, analysis and management of those risks. This work would include the application of BS EN 31010-2010 Standard ‘Risk Management - Risk Assessment Techniques’. Annex A.1 of this standard shows the tools that can be applied at each step of the risk assessment process. Annex A.2 shows the factors influencing selection of risk assessment tools.

With reference to Annex A.1 of this British Standard BS EN 31010:2010, a variety of tools and techniques that can be applied to perform or to assist with the risk assessment process are
listed and further explained, there are 31 tools/techniques listed, and the only two tools/techniques that are categorized to be ‘Strongly Applicable’ for all stages of risk identification, consequence, probability, level and evaluation are; 1) the tool of Failure Mode Effect Analysis (FMEA), and 2) the tool of Reliability Centered Maintenance. Therefore, the application of these two tools/techniques is recommended and their integration within auditing framework would be a subject for further study.

Consequently, the results of the analysis by themes (output of section 6.2.3) and the results of analysis from the perspective of risks (output of section 6.2.4) were presented to part 2 of the management review meeting to enable the participants to comment on the result of data analysis and to be involved in the development of the metrics of internal audit PM and proposed PAF.

As stated in section 2.3.1.7, each organization can develop its own metrics for performance measurement of its internal audits and based on Bota-Avram and Pali (2009) who argued that the internal audit process must have its own controls to track whether its performance is consistent with its objectives, the attendees of part 2 of the MRM agreed with the researcher to build up metrics for performance measurement of the auditing framework and the audits of this case study. These metrics will be part of the evaluation criteria that have been mentioned earlier in section 4.5.2 and Table 4.4.

6.2.5 Development of Metrics for Performance Measurement of internal audits

The result of the above data analysis was reviewed against the research rationale (section 1.2) and this resulted in suggesting the following two metrics:

1. The criticality of the consequences of the risks identified during audit.
2. Level, extent and materiality of audit evidence (audit samples).

At the end of the MRM (part 2), this author prefers to validate the proposed PAF by means of evaluating the results of data analysis (outputs of sections 6.2.2, 6.2.3, 6.2.4 and 6.2.5). This validation takes the form of workshop that is attended by further participants who are the five
internal auditors of GMRA. The result of this workshop is explained in section 6.3 below. So, the main purpose of this workshop was to comment on and validate the content of the suggested PAF.

6.3 Research Validation

6.3.1 Determination of Validation Method and Form in This Study

6.3.1.1 Validation of the Research Data

As mentioned earlier in section 4.4.1 and 4.4.2, the validation in this research study was undertaken in different ways, which included; 1) the audit of all participants in combination by implementing the procedures of group interviews, observations, documents review and technical analysis and 2) the focus group of MRM by involving further participants.

As explained earlier in Fig. 4.1, the validation by the triangulation method has already been used to validate the audit evidences prior to transforming them into audit findings and to validate these audit findings prior to categorizing them into conformities, non conformities, risks and OFIs.

To assure the reliability and validity (credibility and trustworthiness) of the data that was collected and analyzed, the auditor focused only on the audit findings ‘AF’ in the form of (non conformities ‘NCs’, risks and opportunity for improvement ‘OFI’) that are: Systematic, Chronic, Factual, Major and Valid. Also, the materiality, validity, correctness and accuracy of the discovered audit findings and their root causes were verified by involving the auditor in this determination and by applying the appropriate management tools at the audit stages of: problem definition, problem solving by identifying and categorize the correct and accurate causes.

The results and output of the research data analysis were validated by comparing them with the most up-to-date relevant literature and the result of this validation is shown below in section 6.4.
6.3.1.2 Validation of the Auditing Framework

In order to determine whether the auditing framework did provide a practical performance measure guide for internal auditing, further validation by triangulation took place in the form of workshop. This workshop was conducted to get the view of further participants who are the five internal auditors in addition to the previous participants (the five auditees). All of these ten participants were called to comment, corroborate, confirm, validate and evaluate the proposed auditing framework based on evaluation criteria of Platts (1993) that have already been explained in section 4.4.3.

This workshop was conducted over two days within one week and it was structured in accordance with the following four steps.

1. Overall presentation on the proposed PAF and the achieved results, provided by the researcher with the necessary background of the research.

2. Discussion of each section of the proposed PAF with the audience and providing them with practical exercises to enhance the understanding of the contents addressed in this framework.

3. Overall presentations on the proposed validation method that is recommended by the researcher, which is Platts (1993) Evaluation Criteria.

4. The audience members (attendees of the workshop) were given a period of one week, to comment on the proposed PAF and then to propose changes, shortening and/or expansion.

Based on the discussions in this workshop, the following changes were recommended by this author and the participants to be made on the proposed PAF.

6.3.2 Result of the Validation of the PAF by Platts (1993) Evaluation Criteria

The answers and feedback of the participants were determined and reviewed during part 2 of the workshop and the results were as follow:

All participants agreed that the PAF can be followed, proving its feasibility. Nevertheless, their opinions were divided regarding its usability, most of them (eight out of a total of ten) agreed that the document can be easily followed and implied that the document has good usability and
they appreciated the audit in combination as applied in this research. One auditee and one internal auditor stated that the framework was not easy to follow and they suggested two improvements that may be relatively easy to implement; 1) incorporate the requirements of each relevant procedure for each department in stage 1 audit to remind the auditee of their duties and responsibilities and also to incorporate of more guidance from the relevant procedure within the framework; and 2) add help boxes in the sections which explain the relevant management technique and highlight the possibility of use of different techniques. In this respect, all five internal auditors and five auditees stated that this approach helped to more easily identify risks, but more work will be needed for risk assessment and risk management. Finally, all of the five auditees and five internal auditors agreed that the framework was useful and provided them with good guidelines to better audit. All ten participants implied that the MRM has major impact upon the performance of the internal audits and it has to be incorporated within the framework. All five auditees affirmed that this audit framework helped them to promote their awareness and improve their competencies relating to performance measures. All ten participants thought that the framework is too long and proposed to shorten it to be limited to the questions and guides that led to the discovery of the factual/chronic/systematic audit’s findings in terms of the audit’s pillars of conformance, performance, risk management and improvement. Prior to responding to these proposed changes, it was vital for the researcher to determine and evaluate the added value, new, indicatives and/or generic that are resulted from the application of the proposed PAF and that are accomplished from this research study in general.

6.4 Evaluation of the Research Data Analysis from the Perspective of Added Value

What are the added value, new, generic and indicatives that organizations attain from this research?

To answer this question, the results of the research data analysis were compared with the most up-to-date relevant literature and this resulted in the determination of the values that are shown in Table 6.9.
### Importance. What it has been accomplished so far?

**1- Using the QMPs of the ISO 9001:2015 Standard as a model for auditing.**

The use of just three QMPs out of a total of seven was demonstrated by authors like Hoyle (2004), Coleman (2015a, b) and Smoth (2016). These three principles are; Engagement of People, Process Approach and Improvement.

**What is the added value?**

The use of all seven principles severally or collectively was demonstrated. (Added value)

### To date, what have associated researchers developed during the last two decades?

**2- Auditing of improvement by integration of the relevant tools**

The limitations with regard to auditing of improvement were handled by integrating the tools that are related to LSS approach, which were found to be appropriate with the ISO 9001 principle of ‘Improvement’, as assumed by this author. The effective implementation and integration of these tools have already been demonstrated by West (2003), Barlow (2013), Coleman (2015a,b) and Smoth (2016).

**What is the added value?**

Auditing of improvement was demonstrated by integrating twelve further tools that are related to ISO 9001:2015 QMPs collectively, and without a need to implement LSS. (Added value)

### What is the added value?

**3- Self-auditing**

There are not many authors who have investigated this topic. Karapetrovic and Willborn (2002) proposed a model for conducting individual self-audits. Also, Canon (1998) states that before audit can be conducted, standards of performance must be established and implemented.

**What is the added value?**

Self-auditing was demonstrated by implementing the proposed PAF and by involving the internal customer of the audited process with the auditees team. (Added value)

### To date, what have associated researchers developed during the last two decades?

**4- Coaching and guiding the auditee by the auditor**

Russell (2013) states that the lead auditors should be careful not to tell the auditees how to complete their work or what decision to make. This prevention could be issued on account of misunderstanding of ISO of clause 6.7 of 19011:2011 Guidelines which states that “the corrective, preventive or improvement actions are usually decided and undertaken by the auditee”. But from the other point of view, it is stated in Annex B.8.4 of the same guidelines that “depending on the arrangements with the audit client, the auditor may guide the auditee on how to respond to those findings”.

**What is the added value?**

The involvement of the auditor in the determination of the NCs causes was demonstrated. (Indicative).

No negative impact confirmed by allowing the auditor to guide and coach the auditee. (Added value).
### Importance. What it has been achieved so far?

<table>
<thead>
<tr>
<th></th>
<th>To date, what have associated researchers developed during the last two decades?</th>
<th>What is the added value?</th>
</tr>
</thead>
<tbody>
<tr>
<td>5- Auditor’s skills in qualitative data analysis is needed.</td>
<td>ISO 9001:2015 Cl. 9.3.2 C (MR Input) focused on the trend analysis, as it stated that “The management review shall be planned and carried out taking into consideration...information on the performance and effectiveness of the quality management system, including trends in...NCs, risks and opportunities...”. Coleman (2013) focused on auditor’s skill in RCA.</td>
<td>Further audit findings and causes have been determined as a result of applying the Content Analysis by themes in the analysis of audit data. (Generic).</td>
</tr>
<tr>
<td>6- The selection of audit samples should be based on: complexity, volume, risk, past problems and audit time span.</td>
<td>Kausek (2008b) presented 10 rules that if practiced will significantly improve the effectiveness of the audit. One of those rules is ‘Never let the auditee pick the samples’. He (2016, P. 31) replied to the new auditor’s question, “How many samples should be drawn and checked? By the answer of: If time allows, the more the better. He (2016) believed that randomness is not always effective and it may mislead the auditor.</td>
<td>Performing self-auditing helped the auditor of stage 2 audit to overcome the audit time limitation by determining more audit evidence by means of information provided in advance. (Indicative).</td>
</tr>
<tr>
<td>7- Auditing several departments in combination.</td>
<td>Bells and Waters, (2004, P. 211) stated that “the interviews reveal only how people perceive what happens, not necessarily what actually happens.”</td>
<td>Interviewing many auditees in combination helped to answer the question; What actually happened? (Added value).</td>
</tr>
<tr>
<td>8- The internal audit should not be closed out until performing of the MR.</td>
<td>ISO 9001:2015 and ISO 19011 emphasized that the audit is completed and closed out when the audit planned activities have been carried out.</td>
<td>Determination of further audit data during the MR was demonstrated. (Added value).</td>
</tr>
</tbody>
</table>

Table 6.9: Evaluation of Added Value and Indicatives. Source: The author
As a result of the data analysis and validation that appeared in sections 6.2, 6.3 and 6.4 respectively, the researcher has agreed with the participants to shorten the PAF to combine some similar questions, and to be limited to the questions and guidelines that have revealed to discovering of valid, major, factual, chronic and systematic audit findings in terms of the audit’s pillars of conformance, performance, risk management and improvement. Therefore, the PAF (Appendix 1) has been shortened accordingly.

6.5 The Final Version of the Auditing Framework

The final version of the auditing framework was derived from the PAF (Appendix 1) that was developed from the CAF, as shown earlier in Fig. 2.8.

Finally, the content of the latest version of the proposed Auditing Framework is illustrated below in Table 6.10.
Part 1: Preamble

This framework would be subject to change by incorporating different management tools, but it has to be ensured that the selected tools are related to ISO 9001:2015 QMPs and can be applied within the audit phases. However, this auditing framework has to be based on the following elements that compose the CAF:

<table>
<thead>
<tr>
<th>ISO 9001:2015 Principle</th>
<th>Their relevant management tools/techniques</th>
<th>Phases of audit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scheduling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Promote awareness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Checklist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problem definition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problem solving</td>
</tr>
</tbody>
</table>

Part 2: Audit Questionnaires Checklist

QMP Number 1: Customer Focus and QMP Number 7: Relationship Management
(5 questions)

1. Which are the main departments that represent your internal customers? How do you reflect the requirements/ needs / expectation / preferences of these internal customers in your processes and organizational structure?

2. How do you verify that all relevant quality dimensions of product and service industry are identified, measured and improved? Verify the consistency between these dimensions and the department objectives and indicators.

3. At your department, what factors need more attention and support than others? How this attention is translated?

4. Have you translated the internal customer’s requirements into clear and complete specification to your internal suppliers?

5. Are the requirements of the next process (your internal customer) maintained, controlled, understood and clearly identified?

QMP Number 2: Leadership and QMP Number 3: Engagement of People
(7 questions)

6. What kinds of leadership techniques are used to ensure that you lead your staff effectively when things get difficult? How? For example, SWOT, PEST, 5Ms, Listening, empowering, valuing and communication. What are the measurement results?

7. How do you ensure that your more experienced employees help less experienced employees? Evidence? What is the procedure? What kinds of tools are used? e.g. Coaching, motivation, delegation and benchmarking.
<table>
<thead>
<tr>
<th>QMP Number</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>How do you retain your talented people? Give examples.</td>
</tr>
<tr>
<td>9</td>
<td>How do you improve the personal effectiveness of your staff? Evidence?</td>
</tr>
<tr>
<td>10</td>
<td>How do you verify that your staffs have a suitable work space, environment, safety, hygiene, security and working with no or minimum risk? Records of verification?</td>
</tr>
<tr>
<td>11</td>
<td>Are records maintained of the mistakes made by process operators? Investigated? Have the causes been determined? What kind of tools used to identify these causes correctly and accurately? Have the appropriate corrective actions been taken? Are they effective? Evidence?</td>
</tr>
<tr>
<td>12</td>
<td>Have these mistakes been analyzed? What is the frequency of these mistakes? How you ensure prevention of their recurrence? What kinds of tools are used? Why? Which is the most effective one?</td>
</tr>
<tr>
<td>13</td>
<td>QMP Number 4: Process Approach, including the Concepts of PDCA and RBT (17 questions)</td>
</tr>
<tr>
<td>14</td>
<td>What methods are followed to control your process and its sub processes? Evidence of implementation? Are they effective? How is effectiveness verified?</td>
</tr>
<tr>
<td>15</td>
<td>How is your process planned, performed, monitored, measured, analyzed, evaluated and improved?</td>
</tr>
<tr>
<td>16</td>
<td>What are the most important measurements in your process?</td>
</tr>
<tr>
<td>17</td>
<td>How do you determine the criticality rating of the equipment, material and structures that belong to your department?</td>
</tr>
<tr>
<td>18</td>
<td>What are the criteria of criticality rating? Have these criteria been implemented, measured and improved?</td>
</tr>
<tr>
<td>19</td>
<td>How do you determine the complexity rating of your process and sub-process</td>
</tr>
<tr>
<td>20</td>
<td>What are the criteria of complexity rating? Have these criteria been implemented, measured and improved?</td>
</tr>
<tr>
<td>21</td>
<td>Records of measurement and monitoring of samples of critical products</td>
</tr>
<tr>
<td>22</td>
<td>Records of measurement of complicated processes.</td>
</tr>
<tr>
<td>23</td>
<td>What risks and threats associated to your process and sub-processes? Who determined these risks? How were these risks determined? Have these risks been prioritized? By which technique? Why?</td>
</tr>
<tr>
<td>24</td>
<td>Have these risks been assessed? Has this Risk Assessment covered all types of threats at your departments, e.g. operational, procedural, financial and political threats.</td>
</tr>
<tr>
<td>25</td>
<td>Which tools are used in the risk assessment? Which is the most effective one? Why?</td>
</tr>
<tr>
<td></td>
<td>Question</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>26</td>
<td>Have the Failure Mode Effect Analysis (FMEA) been determined? For which components?</td>
</tr>
<tr>
<td>27</td>
<td>Have the FMEA been issued for all critical components? Like pipeline? What about the other components?</td>
</tr>
<tr>
<td>28</td>
<td>Have the Risk Management (RM) been determined for all components that their risks are controlled by FMEA?</td>
</tr>
<tr>
<td>29</td>
<td>Have you planned to use any one of the strategy tools, like SWOT, PEST and Prioritization Strategy to help you in the determination of ignored risks? Why / why not?</td>
</tr>
<tr>
<td>QMP Number 5: Improvement, including the Concepts of PDCA and RBT (21 questions)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>What advantages does the Department have?</td>
</tr>
<tr>
<td>31</td>
<td>What unique or lowest-cost resources can they draw upon that others can’t?</td>
</tr>
<tr>
<td>32</td>
<td>What could you improve?</td>
</tr>
<tr>
<td>33</td>
<td>What should you avoid?</td>
</tr>
<tr>
<td>34</td>
<td>What good opportunities can your department spot?</td>
</tr>
<tr>
<td>35</td>
<td>What obstacles does your department face?</td>
</tr>
<tr>
<td>36</td>
<td>Have you identified and listed your problems periodically?</td>
</tr>
<tr>
<td>37</td>
<td>Have you identified the root cause of every problem identified?</td>
</tr>
<tr>
<td>38</td>
<td>What kind of techniques have you used to define these problems correctly and accurately? For example, 4W/2H/1C.</td>
</tr>
<tr>
<td>39</td>
<td>What kind of techniques have you used to determine the root cause of each problem? For example, RCA, 5Whys, and 5Ms.</td>
</tr>
<tr>
<td>40</td>
<td>Have you determined the consequences of each problem and risk? What kinds of risk assessment techniques are used? E.g. FMEA.</td>
</tr>
<tr>
<td>41</td>
<td>Have you grouped your problems and risks with other problems together by their root causes, consequences and cost of their correction?</td>
</tr>
<tr>
<td>42</td>
<td>Based on their consequences, cost and root causes, have you identified the highest and lowest priority by score?</td>
</tr>
<tr>
<td>43</td>
<td>Have the root causes of each one of the non conformities and risks been identified and followed up? How? By who?</td>
</tr>
<tr>
<td>44</td>
<td>How the causes are grouped? Manpower, machine, material, technology, physical, measure, system?</td>
</tr>
</tbody>
</table>
### How the causes are analyzed?
- Which tools are used in this analysis?

### Have the problem solving tools been applied to determine the root cause of each non-conformity? How? Which tools? 5Ms, RCA and 5 whys.

### Has the effective implementation of these tools been followed up? How? By who?

### What kinds of data analysis conducted?
- Quantitative and/or qualitative? Why?
- If qualitative, what kind of technique applied? Why? i.e. analysis by themes / Analysis from the perspective of failure prediction and prevention.

### How did you ensure of the validity, reliability and/or credibility of that analysis?

### Have the results of that analysis been evaluated against agreed objectives and indicators?

### QMP Number 6: Evidence Based Decision Making (6 questions)

#### Have the above data analysis been considered by you and your top management, when you intend to take decisions? How? Evidence?

#### Have you been consulted or involved in making of such decisions? How?

#### What kinds of Decision Making Tools are used? For example, PDCA and prioritization. Are they effective? Give evidence.

#### For making decisions, have you applied the appropriate Model? Like: Observe-Orient-Decide-Act Loop / Plan-Do-Check-Act Model? /How? Records of application?

#### Before making of the decision, have you:
- Identified and analyzed the problem by use of one of the problem definition tool problem and problem solving tools?
- Developed and tested a potential solution by use of some techniques like Impact Analysis?

#### After making of decisions, have you implemented the improved solution fully? How?

### Part 3: Guidelines

List of the documents that need to be reviewed by auditors and auditees prior to audit. (They usually include: policy and its objectives; manuals; plans; procedures; work instructions; standards, guidelines, specifications, drawings, forms; reports; previous internal audit reports, risk assessment reports, management review reports, the internal customer feedback report).

Listing the most important parts of that documents that need attention as an appendix.

List of the evidence which demonstrate that none of the above documents and reports contain untruthful information.

List of the evidence which demonstrate that awareness of the auditee to the relevant documents, record, and relevant management tools is adequate.

Comment on the capability of the auditee to conduct an effective self-audit.

Table 6.10: The Final Version of the Auditing Framework. Source: The Author
It can be noticed from this framework that the QMP number 4 (Process Approach) and QMP number 5 (Improvement) are represented by 38 questions out of a total of 56. In other words, the QMP number 4 and QMP number 5 represent 67% of the content of this framework. Therefore, this author has got to answer this predictable question; why does the author divided the seven QMPs amongst the framework unequally? To answer this question, it is important to refer to the CAF (Table 2.6) and then to remember the following points:

- The concepts of PDCA and RBT are embedded within the two principles (QMPs number 4 and 5) that form the highest proportion of the framework.

- The other QMPs, which are the principles number 1, 2, 3, 6 and 7 are concentrated and embedded within the other phases of audits, which include the planning, scheduling, determining the auditee team, communication and problem solving.

This final version of the auditing framework would also be subject to change to include different guides that could also enhance the audit’s effectiveness in different ways, which may include the following concerns:

- This auditing framework can also be used to promote the auditee’s awareness of the audit criteria to enable them to perform an efficient self-auditing prior to being subjected to the main audit. Therefore, this framework would be subject to change to incorporate different audit criteria and different guiding material that further auditees may need to be familiar with.

- There is a significant number of management tools available, but the selection of the most appropriate is not an easy task. Therefore, it is important to coach the auditors and self-auditors on how, when and which tools should be used in the audit phases of planning, execution, problem definition, risk identifications and problem solving.

Chapter 7 discusses the study findings, evaluation, contribution and conclusions. The limitations of this study are also analyzed and further research is proposed in this chapter.
Chapter 7: Conclusion

7 Conclusion

This chapter provides the conclusions of the thesis. Section 7.1 describes the summary of the thesis and explains how the outputs of data analysis were evaluated to guide the conclusion.

Section 7.2 explains the evaluation and contribution of the research, which is divided as follows:

Sub-section 7.2.1 explains the evaluation and contribution with regard to the approved metrics of audit performance measurements.

Sub-section 7.2.2 explains the evaluation and contribution with regard to realizing the ROs.

Sub-section 7.2.3 explains the evaluation and contribution with regard to answering RQs.

Sub-section 7.2.4 explains the evaluation and contribution to the body of practice by determining the new and added values of this research.

Sub-section 7.2.5 addresses the contribution to the body of knowledge.

Section 7.3 addresses the final conclusion.

Section 7.4 addresses the limitations and suggests further research.

7.1 Introduction

The main aim of this research was to develop the auditing framework which would assist the organizations that experience difficulties with the current ISO 9001 quality audit to achieve their planned objectives and desired benefits with regard to their auditing of performance, risk management and improvement in combination.

It is reported in the literature that the organizations which implement ISO 9001 quality audit are able to demonstrate the effectiveness of their auditing of conformance, but they may fail to achieve their objectives in terms of their auditing of performance, risk management (RM) and improvement in combination. Most of the previous suggestions to overcome this problem were to: 1) focus on processes in addition to ISO 9001 clauses; 2) apply the principle of ‘Process Approach’ of the ISO 9001 Standard by integration of its risk based thinking concept (RBTC); and 3) apply the approach of Lean Six Sigma (LSS) by integration of its related tools. However, it is revealed that the integration of these approaches within audit also has limitations, such as: 1) the possibility of not auditing the most important things; 2) the desire to foster programs for RM
and LSS; 3) the need to assign competent auditor and capable auditee; and 4) the possibility of improper use of sampling method when collecting audit evidence.

To respond to these audit limitations, a further literature review was undertaken to develop a conceptual audit framework (CAF). It suggests the integration of twelve management tools that are connected to the seven QMPs of ISO 9001:2015 severally and collectively. Consequently, a preliminary auditing framework (PAF) was developed based on; 1) the CAF, 2) the results of the documentation review, and 3) the complaints and practical needs of the selected organization (GMRA). This PAF includes the questions and guides that reflect the seven QMPs of ISO 9001:2015 and their related management tools. This PAF was thoroughly tested and validated by a further mixed methods study including eleven internal audits, two management reviews and three workshops. Additionally, The relevant audit standards and guidelines were reviewed to determine the gap in relation to the audit limitations and to the enhancement of this framework. Applying, testing and validating the PAF, resulted in identification of audit findings and their causes, which were also analyzed and validated by mixed analysis methods.

The outputs of this data analysis were evaluated to guide the conclusion based on the outcome and contribution of this research in terms of the following actions:

7.2 Evaluation, Outcomes and Contribution of this Research

This section briefly summarizes the outcomes of the research in terms of its evaluation against the approved audit performance measure metrics, RQs, ROs, the added value that has been achieved from it and its contribution to the body of practice and knowledge.
7.2.1 The Evaluation and Contribution with regard to the Approved Metrics of Audit Performance Measurements

<table>
<thead>
<tr>
<th>Metric</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 The criticality of the consequences and effect of the risks identified during audit</td>
<td>The group interview by auditing the five departments in combination was effective in identifying and addressing the types of consequences of the risks identified. The auditor and auditees have successfully determined the types of consequences for 19 risks out of a total of 22 risks of stage 2 audits. These consequences were categorized critical, because they were related to the main product of the audited processes (pipeline integrity) and they might lead to crisis if no preventive actions are taken.</td>
</tr>
</tbody>
</table>
| 2 Level, extent and materiality of audit evidence (samples)            | This framework allowed the auditor to conduct more in-depth investigation than the previous internal audits. The AFs that were discovered by the audits of this case study were much more than the AFs of the previous internal audits. In other words, the range of audit evidence and audit samples that were covered during the audits of this case study were wider and more important than the samples that were covered by the previous internal audit.  

The materiality of audit evidence was verified through validating the types of audit findings. All of the 70 AFs raised during stages 1 and 2 of this research audits were major, valid, systematic, chronic and factual. |

Table 7.1: Evaluation with regard to the developed metrics. Source: The author

In order to avoid the redundancy, biased and ambiguous evaluation; it was vital to assess the contribution of this research study from different perspectives, which are as follows:
### 7.2.2 The Evaluation and Contribution with regard to Realizing the ROs

<table>
<thead>
<tr>
<th>Research Objectives</th>
<th>Status / Evidence</th>
</tr>
</thead>
</table>
| 1. To identify the limitations of the PM methodologies by ISO 9001 quality audit and Self assessment using BEMs that were experienced by different organizations, as reported in literatures. | Realized.  
**Evidence:**  
Most of the audit limitations identified are related to lack of criteria to audit performance, improvement and risk management.  
Additionally, the time limitation and discontinuity of audit, which might prevent the auditor from auditing the most important matters of the audited process.  
Most of the limitations of the self assessment using BEMs that were experienced by different organizations are related to the needs for management tools as well as the right and desirable organizational culture. |
| This objective is realized in:  
- Sections 2.2.2.1 and 2.2.2.2, P. 19-20  
- Section 2.2.3.2, P. 23-25 |  |
| 2. To determine the audit program strategies that that were reported in literatures to overcome these audit limitations. | Realized  
**Evidence:**  
The strategies that have sufficiently been reported in literature included the following actions;  
- Auditing of performance by incorporating the tools that are related to the ISO 9001 principle of Process Approach.  
- Auditing of risk management by Incorporating the ISO 9001 RBTC.  
- Auditing of improvement by incorporating the tools that are related to ISO 9001 principle of Improvement.  
Additionally, the notion of self-auditing is strongly advocated by the researcher. |
| This objective is realized in:  
- Section 2.3, P. 23-25 |  |
| 3. To determine a way of auditing that would enable the organizations to audit of conformance, performance, improvement and risk management collectively and effectively. | Realized.  
**Evidence:**  
Development of the auditing framework that is based on the integration of all seven QMPs of ISO 9001:2015 severally or collectively.  
Utilizing and integrating these principles through their related management tools. |
| This objective is realized in:  
- Section 2.4, P. 50-54  
- Section 6.5, P. 152-157 |  |
| 4. To determine how the application of the aimed framework might enhance the role of auditor and auditees. | The following roles were realized:  
Auditor as problem solver, coach, risk identifier, data analyzer/evaluator.  
The role auditor as risk assessor could not be realized.  
The role of the auditee to be self-auditor was realized.  
**Evidence:**  
The output of Data analysis by themes. |
| This objective is realized in:  
Section 6.4, Table 6.9, P. 149-151 |  |

Table 7.2: Evaluation with regard to realizing ROs. Source: The author
### 7.2.3 The Evaluation and Contribution with regard to answering the RQs

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Can the ISO 9001:2015 standard be utilized through its principles instead of its clauses to overcome the limitations of ISO quality auditing? And How?</td>
<td>Yes. It is substantiated that these QMPs can form more effective basis for auditing when they are integrated within audit through their related management tools. Evidence: The extent and degree of audit evidence and audit findings that resulted from the audits of this case study.</td>
</tr>
<tr>
<td></td>
<td>The answer of this question is in:</td>
</tr>
<tr>
<td></td>
<td>- Table 2.3, P. 51</td>
</tr>
<tr>
<td></td>
<td>- Last paragraph, P. 51</td>
</tr>
<tr>
<td></td>
<td>- Section 2.4.2, P. 52</td>
</tr>
<tr>
<td>2 Which tools are needed for the auditor to apply the ISO 9001:2015 QMPs as a model for auditing? How, where and when can these tools be used during audit?</td>
<td>- The twelve tools and phases that appeared in the CAF. - The tools that are consistent with the complaints of the audited organization. However, the incorporation of the alternative tools that are consistent with different complaints might offer further improvement in the robustness of this framework. Evidence: Table 2.5 and Table 2.6 respectively</td>
</tr>
<tr>
<td></td>
<td>The answer of this question is in:</td>
</tr>
<tr>
<td></td>
<td>- Section 2.4.3, P. 53-54</td>
</tr>
<tr>
<td></td>
<td>- Tables 2.5 &amp; 2.6, P. 55-56</td>
</tr>
<tr>
<td>3 To what extent does the integration of these tools help the auditee to conduct an effective self-auditing and help the auditor to enhance the audit’s effectiveness and focus on the most important things?</td>
<td>The development of the PAF as a mix between audit checklist and guideline helped the auditee to carry out an effective self-auditing (stage 1 audit) prior to being audited and as a result, it helped the auditor to focus on the most important matters during stage 2 audit. Evidence: Results of stage 1 audit (self-auditing) and stage 2 audits that are shown in Appendices 4 and 5.</td>
</tr>
<tr>
<td></td>
<td>The answer of this question is in:</td>
</tr>
<tr>
<td></td>
<td>- Section 2.3.4, P. 49-50</td>
</tr>
<tr>
<td></td>
<td>- Table 3.2, P. 81</td>
</tr>
<tr>
<td></td>
<td>- Section 6.2.1.3, P.128</td>
</tr>
<tr>
<td></td>
<td>- Row 1 of Table 6.3, P. 137</td>
</tr>
<tr>
<td></td>
<td>- Row 9 of Table 6.3, P. 139</td>
</tr>
<tr>
<td></td>
<td>- Tables 6.4 &amp; 6.5, P. 140-141</td>
</tr>
<tr>
<td>4 Can the risk assessment be undertaken during internal audit by use of such tools? And how?</td>
<td>No, the audit framework succeeded in risk identification, but more work will be needed for risk assessment (probability, severity, level and evaluation). Evidence: The probability and severity of each risk consequence could not be assessed.</td>
</tr>
<tr>
<td></td>
<td>The answer of this question is in:</td>
</tr>
<tr>
<td></td>
<td>- Section 6.2.1.6, P. 130</td>
</tr>
<tr>
<td></td>
<td>- Table 6.2, P. 130</td>
</tr>
<tr>
<td></td>
<td>- Rows 5-6 of Table 6.3, P. 138</td>
</tr>
<tr>
<td></td>
<td>- Tables 6.4 &amp; 6.5, P. 140-141</td>
</tr>
<tr>
<td></td>
<td>- Table 6.8, P. 145</td>
</tr>
</tbody>
</table>

Table 7.3: Evaluation with regard to answering RQs. Source: The author
7.2.4 The Evaluation and Contribution to The Body of Practice by Determining the New and Added Value of this Research

Finally, the contribution of this researcher to practice and knowledge is explored by means of answering the question; What it has been achieved from this research study so far? Therefore, the following values were categorized as contributions.

- Use of QMPs of ISO 9001:2015 severally or collectively as a model for auditing.

- The effectiveness of the developed auditing framework was verified in determination of the accurate AF’s causes that are found to be connected with the customer complaints (section 1.2), and most of these causes were related to the management system of the audited organization. They include: 1) the unavailability of risk management role, 2) non implementation of any of management tools during audit and 3) the insufficient awareness among internal auditors and department managers of these tools.

- The developed auditing framework, in addition to its use as a checklist tool and an audit criteria, it can also be used for guiding the auditee to conduct an effective self-auditing.

- The performance of internal audit process can be improved by integrating some of the relevant management tools within auditing. The selected tools have to be: 1) related to ISO 9001:2015 QMPs severally or collectively, 2) synergistic to the audit pillars of conformance, performance, improvement and risk management, 3) integrated within auditing at its different phases, which include planning, execution, data gathering, data interpretation and closing out and 4) valid for defining, solving, interpreting and analyzing of audit evidence and audit findings.

- It is an error to pick the management tools first and then be limited by the data that tool will generate. Therefore, the method used at each stage of audit should include a diversity of management tools. This will include management assertion by performance of materiality and risk assessment to minimize the risk of reaching an incorrect conclusion based upon audit findings.

- The auditor can be a coach for the auditees.
- The involvement of auditor in the determination of problem solving was helpful.

- The data analysis during the stage of management review should not only be limited to trend analysis, but should include further analysis, like analysis by themes.

- Applying self-auditing prior to the main audit helped the auditor to check additional audit samples and review wide range of audit evidence.

- The customer of the process being audited should be one of the auditee’s team members.

- Auditing many departments in combination helped the auditor to focus on most important matters.

- The internal audit should not be closed out until performing the management review.

The following **recommendations** have been considered by this research as central elements of ISO 9001 quality audit:

- The determination of the process complexity and MS criticality should be part of the audit plan.

- Performing the pre-audit in the form of self-auditing (stage 1 audit).

- Performing the main audit by group interview (stage 2 audit).

- To ensure collecting valid, appropriate and the most important data during audit and to give deeper meaning from this data, the collection method shall include a diversity of audit tools, such as checklist, interview, observation, analysis and technical verification. The audit evidence and audit findings should be validated by using these audit tools in combination wherever practical.

- Conducting MR (stage 3 audit) after each audit.

- Analyzing the results of audits by using a suitable qualitative method, such as: 1) analysis by theme and 2) analysis from the perspective of failure prediction and prevention.
Validating the result of data analysis by using a suitable tool, such as ‘Triangulation’, which was successfully used in validating the audit evidences, audit findings, non-conformities, risks, problem’s causes, and risk’s consequences of this research study.

This research study also resulted in development of qualitative PM metrics for internal audits, which is based on the qualitative valuableness of their contents, whereas most organizations use quantitative metrics, such as the metrics that are based on the Balanced Scorecard Model. These metrics that were developed by this study consist of; 1) the criticality of the consequences of the risks identified during audit and 2) level, extent and materiality of audit evidence (audit samples). The effectiveness of these two metrics was substantiated, because when they have been applied, the audits of this study led to; 1) prediction of critical consequences that are related to technical and technological failures and 2) covering wide range of audit evidence and audit samples by the auditor.

The developed auditing framework was designed for being used by practitioners and will be of interest to quality auditors, quality managers, top management, consultants and ISO experts. The risk management specialists may also be interested in using this framework to identify the first step of risk management, which is the risk identification.

7.2.5 Contribution to the body of knowledge

The identification of ISO 9001 quality audit problems led to the development of this auditing framework, which traced the relationships between auditing problems and their impacts on the conformance, performance, risk management and improvement of the QMS of the organizations that implement ISO 9001 as a model of auditing.

This research has contributed to the existing body of knowledge by:

- Identifying how ISO 9001 quality audit can be improved through a novel application.
- It is substantiated by this application that the QMPs of ISO 9001:2015 can form a more effective basis for auditing when they are integrated within auditing through their related management tools.
- It is substantiated by this study that audit should be based on problem definition and problem solving approaches in combination.
- It is demonstrated that the problem definition approach shall comprise the following points; 1) Identifying the problems and risks during audit by using a suitable problem definition tool, 2) determining the degree of severity and the form of each problem, in order to determine their effects, causes, and consequences correctly and accurately, and 3) determining the frequency and intensity of each problem, in order to analyze and evaluate them impartially.

- It is demonstrated that the cycle of problem solving approach shall be completed to include; 1) determining the causes of problems and risks by suitable problem solving tools, 2) categorizing the causes by using relevant tools, 3) determining the consequences and effect of those causes by using at least one of the risk assessment tools, such as the tool of Failure Mode Effect Analysis (FMEA), 4) Analyzing the results of audits with their causes by using one of the appropriate qualitative methods, such as analysis by themes and 5) plan for corrective or preventive action.

The conclusion of this research and the results concerning the current state of the art for quality audits, including the auditing framework, should be of interest to strategic quality management academics and professionals.

7.3 Final Conclusion

This research is focused on how to utilize ISO 9001 in a way that helps the organizations to audit the conformance, performance, risk management and improvement in combination. In this way, the auditing approach will be changed from ISO 9001 elements to ISO 9001 principles by integrating the most appropriate tools that are related to these principles severally and collectively. To attain this objective, an auditing framework was developed by the author of this study.

This study revealed that the seven ISO 9001:2015 principles can be integrated within the proposed auditing framework through their related management tools. It is also demonstrated that these selected tools are consistent with some the audit limitations that have been previously reported in the literature and are connected with all of the customer complaints that have been identified in the research rationale (section 1.2).
The output of this research indicated that the change of auditing approach from ISO 9001:2015 elements to ISO 9001.2015 principles and the use of the quality management tools/techniques by the auditors are needed.

7.4 Limitations of the Study and Further Research

Finally, the evaluation of the developed auditing framework for conducting the desired audits has presented the following limitations:

a. Due to the time and resource constraints of this research, only eleven in-depth audits, two management reviews and three workshops were conducted at only one organization for testing the proposed framework. The robustness of this framework might be further improved if more test audits had been applied at different organizations with different scope of work. Therefore, it would be desirable for this framework to be tested by further practitioners.

b. This case study incorporated certain types of management tools, that are consistent with the complaints of the audited organization (GMRA). However, the incorporation of the alternative tools that are consistent with different complaints might offer further improvement in the robustness of this framework.

c. The robustness of the developed audit framework in self-auditing might have been further investigated if more self-audits had been carried out.

d. The final version of the proposed framework was suited for certain types of audit findings at certain organization. Hence, there may be different factors affecting the content of this framework if different audit findings are discovered.

In order to increase the generalization of this auditing framework, future research is recommended to test its final version in different organizations within different industries. This framework should be subjected to verification by comparison with available data and then further tested by series of step by step procedure to lead finally to formulate an advanced framework by applying of the hypothetico-deductive quantitative method.

The robustness of the developed audit framework in risk management might have been further investigated if more tools had been applied. The tool of Failure Mode Effect Analysis (FMEA) would be helpful to expand the role of auditor from risk identifier to risk assessor.
The tool of FMEA in particular is recommended to be integrated within the auditing framework and then tested by a further research. This tool is selected because it has already been strongly suggested by Annex A.1 of the relevant British Standard BS EN 31010:2010 to be applied with the risk assessment process, and due to its partial implementation by GMRA during its investigation in 2002 to determine the main cause of the pipeline failure that occurred during the period of 1999-2002 (as explained earlier in section 1.1 of this thesis).

Finally, further research is recommended to investigate the possibility for the auditor to be risk analyzer.
# Appendices

| Appendix 1 | The preliminary auditing framework (PAF) |
| Appendix 2 | Results of previous internal audits of 2016 |
| Appendix 3 | Results of the last certification audit 2016 |
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| Appendix 5 | Results of stage 2 audits |
| Appendix 6 | The presentations that were provided by the author to the participants |
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| Appendix 15 | The evidence of passing the advanced audit technique exam |
Appendix 1: The Preliminary Auditing Framework (PAF)

This framework has to be used by two stages:

- Stage 1 audits (self-auditing), which need to be conducted by the auditees at their own departments
- Stage 2 audit, which need to be conducted by the auditor at the auditee’s premises

<table>
<thead>
<tr>
<th>Department and Process Audited:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The below five departments in the Great Man made River Project Authority</td>
<td></td>
</tr>
<tr>
<td>Pipeline Inspection Techniques</td>
<td></td>
</tr>
<tr>
<td>Corrosion Protection</td>
<td></td>
</tr>
<tr>
<td>Operation and Maintenance</td>
<td></td>
</tr>
<tr>
<td>Technical Affair</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location: Benghazi HQ</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Audits: From 30 April 2017 to 4 June 2017</td>
<td></td>
</tr>
</tbody>
</table>

**Questionnaires Checklist / Guidelines**

QMP Number 1: Customer Focus and QMP Number 7: Relationship Management

Identify your customers (internal and external)

Which is the main department in GMRA that represent your internal customer?

Have you segmented these customers by value, products and methods of delivery?

How have your customer’s preferences been reflected in the processes and organisational structure?

How do you classify your customers, for example, Service User, Service Receiver, and Funds Provider?

How do you distinguish between customers, from priority point of view i.e. Primary Customer, Secondary Customer and Tertiary Customer?

How do you distinguish between customers, from marketing point of view i.e. Current Customer, Future Customer, and Competitors?
How do you measure each customer’s view of your department?

Are these effective?

How do you reflect the customer requirements/needs/expectation/preferences in your processes and Organizational Structure?

How do you establish an internal customer survey checklist, covering all relevant quality dimensions of product industry?

How do you establish an internal customer survey checklist, covering all relevant quality dimensions of service industry?

How do you determine the dimensions that are more important?

How do you established constructive relationship and communication with each of your customers, including internal customers?

Identify the quality dimensions that are relevant but have not been determined, and why?

How do you mutually agreed a system of feedback, measurements and targets?

**QMP Number 2: Leadership and QMP Number 3: Engagement of People**

**Identify the purpose (objectives) of your Process**

Have the objectives and KPIs been determined for the processes of your department?

Have you established plan explaining how to achieve these objectives and conduct measurements against agreed KPIs?

Have you ensured of the effective implementation of this Plan?

Do you have evidence for that?

Have you ensured that these KPIs are sufficient for success to overcome the new threats and risks raised recently as result of the new political change in Libya?

If the answer is No:

Why?

Do your KPIs includes Quantitative and qualitative indicators?

Have the Critical Success Factors (CSF) been determined with your KPIs (factors those are needed by any organization wanting to succeed).

**CSF in people and individuals**

**CSF in process and measurement**

**CSF in equipment, work place, money.**
At your department, and as a result of the new political change, what factors need more attention and support than others?

What kinds of support are needed?

What will happen if this support is not provided?

Have the necessary support been covered by Plans or Risk Management?

**QMP Number 4: Process Approach Including the Concepts of PDCA and RBT**

### Identify your process inputs

How do you verify that the requirements of the previous process (your internal supplier) are maintained, controlled, understood and clearly identified?

Have you translated the internal customer’s requirements into clear, complete specification to your internal suppliers?

Have the legal requirements (related your process) been identified and maintained?

What information is required for your process? Is it controlled? Who is providing it?

What materials/ raw materials are required for your process? (Evidence of Purchasing and inspection in accordance to the relevant clause of ISO 9001 and your Purchasing Procedure)?

### Identify intended output

What is the product which results from the process. It could be product, bi-product, service and/or sub service)

Are the requirements of the next process (your internal customer) maintained, controlled, understood and clearly identified?

### Establish the flow of activities

How do you plan to execute your process and its sub-processes? What steps and actions are important?

How these steps are Identified, and measured?

### What resources are used in executing of your process and its sub-processes?

People involved.

Have the required (Training/ Competence/ Skill/ Qualifications) been determined?
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there Job Descriptions or Procedure issued to cover authority and responsibility and reporting lines?</td>
<td>Are your staff aware of their responsibilities?</td>
</tr>
<tr>
<td>How do you ensure of their awareness?</td>
<td></td>
</tr>
<tr>
<td>Have you used any of the leadership techniques to ensure that you lead your staff effectively when things get difficult?</td>
<td><strong>How do you ensure that you have:</strong></td>
</tr>
<tr>
<td>- Selected and developed the right people (i.e. assessment, test)</td>
<td>- Selected and developed the right people (i.e. assessment, test)</td>
</tr>
<tr>
<td>- Delegated them effectively (i.e. ensuring that they have the right skills, training and motivation)</td>
<td>- Delegated them effectively (i.e. ensuring that they have the right skills, training and motivation)</td>
</tr>
<tr>
<td>- Motivated them effectively (i.e. providing feedback in regular basis)</td>
<td>- Motivated them effectively (i.e. providing feedback in regular basis)</td>
</tr>
<tr>
<td>- Managed their disciplines</td>
<td>- Managed their disciplines</td>
</tr>
<tr>
<td>- Resolved their conflict effectively</td>
<td>- Resolved their conflict effectively</td>
</tr>
<tr>
<td>- Communicated with them effectively</td>
<td>- Communicated with them effectively</td>
</tr>
<tr>
<td>- Developed their skills relating Problems Solving, Decision Making and Project Management</td>
<td>- Developed their skills relating Problems Solving, Decision Making and Project Management</td>
</tr>
<tr>
<td>Have you conducted surveys to assess people’s satisfaction, communicated the results, and taken appropriate actions?</td>
<td><strong>How do you ensure that your more experienced employee help less experienced employee?</strong></td>
</tr>
<tr>
<td>How do you retain your talented people?</td>
<td><strong>How do you retain your talented people?</strong></td>
</tr>
<tr>
<td>How many specialists left your organization of the last three years?</td>
<td><strong>How do you retain your talented people?</strong></td>
</tr>
<tr>
<td>Have you determined the causes?</td>
<td><strong>How do you retain your talented people?</strong></td>
</tr>
<tr>
<td>Have you taken any corrective action?</td>
<td><strong>How do you retain your talented people?</strong></td>
</tr>
<tr>
<td>How do you improve the personal effectiveness of your staff?</td>
<td><strong>How do you retain your talented people?</strong></td>
</tr>
<tr>
<td>i.e. enable self-evaluation of performance against personal objectives</td>
<td><strong>How do you retain your talented people?</strong></td>
</tr>
<tr>
<td>Agreeing SMART Objectives</td>
<td><strong>How do you retain your talented people?</strong></td>
</tr>
<tr>
<td><strong>Equipment needed.</strong></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td>Review the list of facilities, equipment, machinery, infrastructure, and select samples to find out:</td>
<td></td>
</tr>
<tr>
<td>How do you verify that those equipment are effective and reliable?</td>
<td></td>
</tr>
<tr>
<td>What test equipment is used?</td>
<td></td>
</tr>
<tr>
<td>Were they calibrated?</td>
<td></td>
</tr>
<tr>
<td>How do you prevent unauthorized use?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Environmental requirements.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you verify that your staffs have a suitable work space, environment, safety, hygiene, security and working with minimum risk?</td>
</tr>
<tr>
<td>Have the risks and threats associated to your process been determined?</td>
</tr>
<tr>
<td>Have the Risk Management of your risks (Accept / share / mitigate) been identified?</td>
</tr>
<tr>
<td>Give examples</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>What are the controls?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>What methods are followed to control your process and its sub processes?</td>
</tr>
<tr>
<td>i.e. Procedures, forms, WI and any other controlling method</td>
</tr>
<tr>
<td>Are the processes adequately detailed in procedures?</td>
</tr>
<tr>
<td>What procedures/W.I/ specification do you need to comply with?</td>
</tr>
<tr>
<td>Are they effectively implemented and maintained?</td>
</tr>
<tr>
<td>Have the authorization and approval of documents been defined and effectively distributed?</td>
</tr>
<tr>
<td>How do you verify that your staff are aware of the procedural requirements?</td>
</tr>
<tr>
<td>What rules do you need to comply with (policy, legal requirements, and regulation)? How do you ensure that these regulations are up to date?</td>
</tr>
<tr>
<td>Are records maintained of the mistakes made by process operators?</td>
</tr>
<tr>
<td>Have these mistakes been analyzed? What is the frequency of these mistakes? How you ensure prevention of their recurrence?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>QMP Number 5: Improvement</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>How is your process monitored, measured, analyzed, evaluated and improved?</td>
</tr>
<tr>
<td>What planned monitoring and measurement arrangements are required?</td>
</tr>
<tr>
<td>Question</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>What checks have been performed to verify that the methods used are best practice? (e.g.</td>
</tr>
<tr>
<td>verification of process/product, in process inspection,)</td>
</tr>
<tr>
<td>Have you identified the most important measurements?</td>
</tr>
<tr>
<td>What are they?</td>
</tr>
<tr>
<td>Have risks and threats associated with your process, their impacts and management been determined?</td>
</tr>
<tr>
<td>Risk Assessment (RA) of your Department / Process / Operation?</td>
</tr>
<tr>
<td>Have the RA of your process covered all types of threats, such as operational, procedural, financial,</td>
</tr>
<tr>
<td>political threats</td>
</tr>
<tr>
<td>Operational threats, like loss of access to sites and infrastructure related to pipeline corrosion</td>
</tr>
<tr>
<td>protection and Inspection stations, loss of data resulting from evacuation of offices, and loss of</td>
</tr>
<tr>
<td>talents who left the work.</td>
</tr>
<tr>
<td>Procedural threats, like failures of accountability, and difficulties to comply with all management</td>
</tr>
<tr>
<td>system requirements.</td>
</tr>
<tr>
<td>Financial threats, like non-availability of funding.</td>
</tr>
<tr>
<td>Technical threats, like technical failures resulting from the illegal pipeline connection and</td>
</tr>
<tr>
<td>departure of technical and consultant partners, especially the ones responsible for pipeline</td>
</tr>
<tr>
<td>inspection</td>
</tr>
<tr>
<td>Political threats, like change in public opinion, government policy, or foreign influence and loss</td>
</tr>
<tr>
<td>of Government support</td>
</tr>
<tr>
<td>Have the external factors resulted from the new political change been considered?</td>
</tr>
<tr>
<td>Have you determined the consequences of these risks?</td>
</tr>
<tr>
<td>If the threats are not considered, why?</td>
</tr>
<tr>
<td>Have you planned to manage these kinds of risks now?</td>
</tr>
<tr>
<td>Have you planned to use any one of the strategy tools of SWOT, PEST and Prioritization Strategy to</td>
</tr>
<tr>
<td>help you in determination of these ignored risks?</td>
</tr>
<tr>
<td>If the previous answer is Yes,</td>
</tr>
<tr>
<td>Have the SWOT of your process been determined? Does it cover the followings:</td>
</tr>
<tr>
<td><strong>Strengths</strong></td>
</tr>
<tr>
<td>What advantages does the Department have?</td>
</tr>
<tr>
<td>What do they do better than anyone else?</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td>What unique or lowest-cost resources can they draw upon that others can't?</td>
</tr>
<tr>
<td>What do people in your department see as their strengths?</td>
</tr>
</tbody>
</table>

**Weaknesses**

<table>
<thead>
<tr>
<th>What could they improve?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What should they avoid?</td>
</tr>
<tr>
<td>What are people in your department likely to see as weaknesses?</td>
</tr>
</tbody>
</table>

**Opportunities**

| What good opportunities can your department spot? |

**Threats**

<table>
<thead>
<tr>
<th>What obstacles do your department face?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are quality standards or specifications for your job, products or services changing?</td>
</tr>
<tr>
<td>Is changing technology threatening the position of your staff?</td>
</tr>
<tr>
<td>Have you determined the effect of change in government?</td>
</tr>
<tr>
<td>Are there any economic factors that you should consider?</td>
</tr>
<tr>
<td>Are there any new technologies that you could be using?</td>
</tr>
<tr>
<td>Are there existing technological hubs that you could work with or learn from?</td>
</tr>
</tbody>
</table>

**Prioritization by Pareto Analysis**

<table>
<thead>
<tr>
<th>Have you identified and listed your problems periodically?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you identified the root cause of every problem identified?</td>
</tr>
<tr>
<td>What kind of techniques have you used to determine the root cause of each problem?</td>
</tr>
</tbody>
</table>

**5 Whys, RCA and 5Ms**

<table>
<thead>
<tr>
<th>Which one did you select? Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you determined the consequences of each problem?</td>
</tr>
<tr>
<td>Have you grouped your problems with other problems together by their root causes, consequences and cost of their correction?</td>
</tr>
<tr>
<td>Based on their consequences, cost and root causes, have you identified the highest and lowest priority by score?</td>
</tr>
<tr>
<td>Have you taken an action based on the above priority?</td>
</tr>
<tr>
<td>Question</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Have your actions focused on preventing of the recurrences?</td>
</tr>
<tr>
<td>Have you prioritized your risks in your contingency plan?</td>
</tr>
<tr>
<td>With reference to the previous certification audits and internal audits conducted at your department, what is your opinion on this audit with comparing with previous audits from the below factors point of view?</td>
</tr>
<tr>
<td>Ways and methods of audit</td>
</tr>
<tr>
<td>Number of samples verified and depth of audit?</td>
</tr>
<tr>
<td>Are there any areas where their prediction and reality differ significantly?</td>
</tr>
<tr>
<td>Have the Auditors focused on what is the most important?</td>
</tr>
<tr>
<td>Have the auditee identified to the auditors the business areas that need more attention?</td>
</tr>
<tr>
<td>Was the Auditor aware of the maturity stages of the audited process from Poor to Best-Class.</td>
</tr>
<tr>
<td>Are there any previous non conformities (NC) determined on your department, its process and sub-processes?</td>
</tr>
<tr>
<td>By who?</td>
</tr>
<tr>
<td>NC identified by you (Self-auditing)?</td>
</tr>
<tr>
<td>NC identified by Inspector or QC?</td>
</tr>
<tr>
<td>NC identified by Internal Auditors?</td>
</tr>
<tr>
<td>NC identified by the Auditors of Certification Body?</td>
</tr>
<tr>
<td>Which of them have added value for you?</td>
</tr>
<tr>
<td>Why?</td>
</tr>
<tr>
<td>Have the root causes of each one of the non conformities been identified and followed up by the Auditors?</td>
</tr>
<tr>
<td>Have the problem solving tools been applied to determine the root cause of each non conformity highlighted?</td>
</tr>
<tr>
<td>Have the implementation of these tools been followed up by the Auditors?</td>
</tr>
<tr>
<td>What kinds of Problem Solving Tools are used?</td>
</tr>
<tr>
<td>Which tool is the most effective one?</td>
</tr>
<tr>
<td>Why you have selected this tool?</td>
</tr>
<tr>
<td>Have you been involved in analyzing of their audits findings? And how?</td>
</tr>
</tbody>
</table>
If the answer is Yes
What kinds of data analysis conducted?

How did you ensure of the validity and reliability of that analysis?

Have the results of that analysis been evaluated against agreed Objectives and Indicators?

**QMP Number 6: Evidence Based Decision Making**

Have your top management taken decisions based on the analysis and evaluation of the previous audit findings and the above mentioned analysis and evaluation?

Have you been consulted or involved in making of such decisions? How?

Have they determined some of the Decision Making Tools?

What kinds of tools they have used? Are they effective? Give evidence.

For making of their decisions, have they applied the OODA Loop Model?

Observe-Orient-Decide-Act and/or Plan-Do-Check-Act Model?

Before making of their decision, have they and you:

Identified and analyzed the problem by use of one of the problem solving tools?

Developed and tested a potential solution by use of some techniques like Impact Analysis?

Measured how effective the test solution was? And analyzed whether it could be improved in any way?

Implemented the improved solution fully?

Appendix 1: The first version of the Preliminary Auditing Framework (PAF). Source: the author

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After completion of the audit data collection, analysis and validation, this PAF will be revised and shortened to be limited to the questions and guidelines that have revealed to discovering of factual, chronic and systematic audit findings in terms of the audit’s pillars of conformance, performance, risk management and improvement, and then all similar questions will be combined and assorted in accordance to the ISO 9001 QMPs serially.
### Appendix 2: Results of previous internal audits of 2016

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The weakness of previous contacts, purchase orders and agreements were not determined in order to be avoided in future contracts.</td>
</tr>
<tr>
<td>2</td>
<td>Non control of some of the documents of external origins, like the manuals and test methods.</td>
</tr>
<tr>
<td>3</td>
<td>No analyses of NCs for more than 2 years.</td>
</tr>
<tr>
<td>4</td>
<td>Delay in calibration of most of pipeline flow-meters.</td>
</tr>
<tr>
<td>5</td>
<td>Non recording of many near misses and incidents, particularly the repeated and systematic such, like security violations.</td>
</tr>
<tr>
<td>6</td>
<td>Delay in responding to some of internal customer’s queries related to technical complaints.</td>
</tr>
<tr>
<td>7</td>
<td>Delay in responding to some of contractor’s submissions.</td>
</tr>
<tr>
<td>8</td>
<td>Delay in submission of monthly reports.</td>
</tr>
<tr>
<td>9</td>
<td>The competence of some process executers (leaders &amp; individual performers) is not subjected to re-evaluation for more than two years.</td>
</tr>
<tr>
<td>10</td>
<td>The effectiveness of 2015 training was not verified.</td>
</tr>
<tr>
<td>11</td>
<td>Some software was not certified to ensure their reliability.</td>
</tr>
<tr>
<td>12</td>
<td>Some of the ‘As Built Drawings’ of pipeline installed at corrosive areas have not been updated to incorporate the latest field changes.</td>
</tr>
<tr>
<td>13</td>
<td>No measurement undertaken for the water production plan of 2015 and 2016.</td>
</tr>
<tr>
<td>14</td>
<td>Some purchase orders were closed out without re-assessment of suppliers, which help the top management to make their decision about re-contracting with those suppliers.</td>
</tr>
<tr>
<td>15</td>
<td>The inspection of supplied materials is not linked with the performance measurement of the suppliers of those materials.</td>
</tr>
<tr>
<td>16</td>
<td>The changes in some of the titles and position of the organization chart were not linked with the changes in the relevant procedures.</td>
</tr>
<tr>
<td>17</td>
<td>Calibration was not performed on the test equipment of water quality labs in the last two years.</td>
</tr>
<tr>
<td>18</td>
<td>Some equipment, like cranes and forklifts are in operation, but not certified by the annual inspection certificates as required by their relevant maintenance procedure.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>19-</td>
<td>The root causes of some nonconformities were insufficient training, but the training plan of 2017 does include this kind of training.</td>
</tr>
<tr>
<td>20-</td>
<td>Most of heavy equipment and lab devices were not labeled with maintenance label that show the next date of maintenance.</td>
</tr>
<tr>
<td>21-</td>
<td>Many of test equipment are calibrated internally, but the calibration methods are not documented.</td>
</tr>
<tr>
<td>22-</td>
<td>Most of the departments’ objectives are not SMART (specific, measurable, achievable, realistic and time scaled).</td>
</tr>
<tr>
<td>23-</td>
<td>Awareness of staff to the quality policy and ISO 9001:2015 requirements needs improvement.</td>
</tr>
<tr>
<td>24-</td>
<td>Awareness of some staff to their responsibilities identified in operation procedures needs improvement.</td>
</tr>
<tr>
<td>25-</td>
<td>Some purchase orders have not been closed out by the QA/QC as required by the purchasing and expediting procedure.</td>
</tr>
<tr>
<td>26-</td>
<td>Some of records are not sufficiently controlled.</td>
</tr>
<tr>
<td>27-</td>
<td>Confidentiality was not considered in the control of employees records.</td>
</tr>
<tr>
<td>28-</td>
<td>Most mobile camps and mobile stores need maintenance.</td>
</tr>
</tbody>
</table>

### Appendix 3: Results of the last certification audit 2016

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td><strong>Competency requirements were not defined for many of the critical positions.</strong></td>
</tr>
<tr>
<td>2-</td>
<td><strong>Many of 2016 internal audits were not performed as planned, and many critical processes were not covered by this plan.</strong></td>
</tr>
<tr>
<td>3-</td>
<td><strong>Some of software used are not controlled as required by Document Control procedure.</strong></td>
</tr>
<tr>
<td>4-</td>
<td><strong>Technical data sheet and safety data sheet of some chemicals are not controlled.</strong></td>
</tr>
</tbody>
</table>

### Appendix 4: The results of stage 1 audits (self-auditing)

These audits were conducted by the participants at their own work to prepare for the main stage by using the criterion of PAF (Appendix 1).

These audits resulted in issue of the following 24 audit findings:

<table>
<thead>
<tr>
<th>Audit findings (NCs, risks and OFI)</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The internal customers (the departments of GMRA organization) have not been segmented by value, products and methods of delivery.</td>
<td>Organizational (Insufficient procedure)</td>
</tr>
<tr>
<td>2. The internal customer’s view on the audited department was not determined.</td>
<td>Organizational (Insufficient procedure)</td>
</tr>
<tr>
<td>3. No internal customer survey checklist established in any form.</td>
<td>Organizational (Insufficient procedure)</td>
</tr>
<tr>
<td>4. No mutually agreed system of feedback is established between the departments.</td>
<td>Organizational (Insufficient procedure)</td>
</tr>
<tr>
<td>5. Lack of partnership and competition with other parties due to the monopolism of GMRA to the scope of work of water production and water distribution (70% of Libyan population depends on this source of water).</td>
<td>Organizational (Insufficient procedure)</td>
</tr>
<tr>
<td>6. Some of the KPIs are not consistent with objectives.</td>
<td>Human (Insufficient training in development of QMS Documentation)</td>
</tr>
<tr>
<td>7. Most of the KPIs are not sufficient for success to overcome the new threats and risks raised recently as result of the political change.</td>
<td>Human (Insufficient training in development of QMS Documentation)</td>
</tr>
<tr>
<td>8. Despite of the new political change, the department has not identified the factors that need more attention and support than other.</td>
<td>Organizational (Unavailability of Risk Management role within the organization chart)</td>
</tr>
<tr>
<td>9. None of the leadership techniques used to ensure that the managers lead their staff effectively when things get difficult.</td>
<td>Human (Insufficient training of top management)</td>
</tr>
<tr>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10</td>
<td>No surveys conducted to assess internal customer’s satisfaction, communicated the results, and taken appropriate actions.</td>
</tr>
<tr>
<td>11</td>
<td>No evidence provided to ensure that the experienced employees help less experienced employees.</td>
</tr>
<tr>
<td>12</td>
<td>Many talents left the work and no corrective action taken, The resignation of talents was not part with the organization’s approved KPIs.</td>
</tr>
<tr>
<td>13</td>
<td>The records maintained do not include any of the mistakes of process operators.</td>
</tr>
<tr>
<td>14</td>
<td>The operational threats have not been documented, i.e. shortage of some critical spare parts.</td>
</tr>
<tr>
<td>15</td>
<td>The procedural threats have not been determined, i.e. loss of many assets, which means non implementation or weakness of emergency procedure.</td>
</tr>
<tr>
<td>16</td>
<td>The financial threats have not been determined, i.e. shortage of budget due to change of political situation.</td>
</tr>
<tr>
<td>17</td>
<td>The technical threats have not been determined, i.e. pipeline failure by different modes.</td>
</tr>
<tr>
<td>18</td>
<td>The political threats have not been determined, i.e. splitting of GMRA organization upon geographically due to splitting of the Libyan government into two governments.</td>
</tr>
<tr>
<td>19</td>
<td>The external factors resulting from the new political change have not been assessed. For example, the difficulties faced to renew some of contracts. The political change and security status affected negatively on contracting with new companies and expatriates.</td>
</tr>
<tr>
<td>20</td>
<td>No risk assessment tools implemented to help in determining, assessing and managing of the above mentioned threats.</td>
</tr>
<tr>
<td>21</td>
<td>None of the departments identified the roles that are not usually performed easily.</td>
</tr>
<tr>
<td>22</td>
<td>Major delay in performing of some technical site measurements.</td>
</tr>
<tr>
<td>23</td>
<td>None of the problem solving tools were applied to determine the root cause of each non conformities raised during previous internal audits and certification audits.</td>
</tr>
<tr>
<td>24</td>
<td>The auditees have not been involved in analyzing of audits findings raised at their departments by internal auditors during previous internal audits.</td>
</tr>
</tbody>
</table>

Appendix 4: The results of stage 1 audits (self-auditing). Source: the author
### Appendix 5: Results of stage 2 audits

<table>
<thead>
<tr>
<th>Audit findings (NCs, risks and OFI)</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  The human mistakes have not been analyzed to ensure preventing of their reoccurrences.</td>
<td>Organizational and human (insufficient procedure and shortage of training).</td>
</tr>
<tr>
<td>2  The risks and threats associated with audited process, their impacts and management have not been determined.</td>
<td>Organizational and human (insufficient procedure and shortage of training).</td>
</tr>
</tbody>
</table>
| 3  No action taken about the following operational threats:  
   - Loss of access to some sites due to security reasons.  
   - Loss of talents due to lack of motivation. | Organizational and human (insufficient procedure and shortage of training). |
| 4  No action taken about the following procedural threats:  
   - Failures of accountability, and difficulties to comply with some of procedural management system requirements, like performing some of site measurements at defined interval. | Organizational (insufficient procedure) and insufficient training). |
| 5  No action taken about the following financial threats:  
   - Unavailability of funding for some of critical processes.  
   - Shortage of budget for some important processes. | Organizational (unavailability of Contingency Plan). |
| 6  No action taken about the following technical threats:  
   - Technical failures resulted of the illegal pipeline connection  
   - Leaving of technical expatriate, experts consultant partners, who are specialized in operation of pipeline risk management inspection system.  
   - Exceeding the design life of zinc and magnesium anodes used for corrosion protection, and the inability to replace them at present time. | Organizational (Unavailability of Contingency Plan). |
| 7  No action taken about the following political threats:  
   - Loss of governmental support.  
   - Change in public opinion.  
   - Change of government policy relating cash flow mechanism. | Organizational and human (No one in the organization has specific responsibility for Risk Management role within the organization). |
| 8 | The external factors resulted of the new political change have been overlooked, for example: leaving of suppliers, and contractors. The reasons behind this overlooking have not been determined at earlier time. | Organizational and human (Unavailability of Risk Management role within the organization). |
| 9 | No plan to implement any of the strategy tools like, SWOT, PEST and Prioritization Strategy to help the department in determination of these ignored risks? | Organizational and human (Unavailability of Risk Management role within the organization). |
| 10 | The strengths of the departments have not been determined. For example, the auditees are required to determine the following:  
- What advantages does the Department have?  
- What do they do better than anyone else?  
- What unique or lowest cost resources can they draw upon that others can’t?  
- What do people in your department see as their strengths? | Organizational and human (Unavailability of Risk Management role within the organization). |
| 11 | The weaknesses of the departments have not been determined. For example, the auditees are required to determine the following:  
- What could they improve?  
- What should they avoid?  
- What are people in your department likely to see as weaknesses? | Organizational and human (Unavailability of Risk Management role within the organization chart). |
| 12 | The opportunities of the department have not been determined. For example, the auditees are required to determine the following:  
- What opportunities can the department spot?  
- What good practices can the department spot? | Organizational and human (Unavailability of Risk Management role within the organization chart). |
| 13 | The threats of the department have not been determined. For example, the auditees are required to determine the following:  
- What obstacles do your department face?  
- The changing in the quality standards or specifications for the job.  
- The changing in technology.  
- Staff weaknesses. | Organizational and human (Unavailability of Risk Management role within the organization chart). |
<table>
<thead>
<tr>
<th></th>
<th>The PEST (Political-Economic and Socio-Technology) of the audited process have not been determined to include the effect of continuous changes in governments and central bank of Libya.</th>
<th>Organizational and human (Unavailability of Risk Management role within the organization chart).</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>- The PEST of audited process have not been determined to include any economic factors that should be considered, like the drop in oil prices.</td>
<td>Organizational and human (Unavailability of Risk Management role within the organization chart).</td>
</tr>
<tr>
<td>16</td>
<td>- The PEST of audited process have not been determined to include any recent socio-cultural that might affect the business, like the deal with local tribes in securing of some sites.</td>
<td>Organizational and human (Unavailability of Risk Management role within the organization chart).</td>
</tr>
<tr>
<td>17</td>
<td>- The PEST of audited process have not been determined to include any new technologies that could be used, like the use of solar energy and water energy.</td>
<td>Organizational and human (Unavailability of Risk Management role within the organization chart).</td>
</tr>
<tr>
<td>18</td>
<td>- The PEST of audited process have not been determined to include any technological hubs that could be worked with or learned from.</td>
<td>Organizational and human (Unavailability of Risk Management role within the organization chart).</td>
</tr>
<tr>
<td>19</td>
<td>The Material/equipment Criticality rating and process complexity rating have not been determined.</td>
<td>Organizational (audit and inspections procedures are not effective and they need to be revised).</td>
</tr>
<tr>
<td>20</td>
<td>The experience gained from previous failures is not transformed into knowledge despite if existing of large volume of data.</td>
<td>Human (shortage of training in use of data analysis techniques).</td>
</tr>
<tr>
<td>21</td>
<td>Existing of large volume of data, but no analysis undertaken to transform these data into information and then into knowledge.</td>
<td>Human (Shortage of training in data analysis).</td>
</tr>
<tr>
<td>#</td>
<td>Issue Description</td>
<td>Origin</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>22</td>
<td>The recommendations that have been identified in the annual reports have not been transformed into objectives.</td>
<td>Human (shortage of training in establishment of objectives and determination of KPIs).</td>
</tr>
<tr>
<td>23</td>
<td>No updating of central data centers for the last two years.</td>
<td>Organizational (Ineffective management review and ineffective internal audits).</td>
</tr>
<tr>
<td>24</td>
<td>Inadequacy of existing information system for meeting urgent needs for rehabilitation, due to delay of the updating to incorporate the latest field changes.</td>
<td>Organizational (Ineffective management review and ineffective internal audits).</td>
</tr>
<tr>
<td>25</td>
<td>Some of staff who are directly responsible for process execution/implementation are not aware of their departments relevant objectives and KPIs.</td>
<td>Human (shortage of short on job training session and awareness)</td>
</tr>
<tr>
<td>26</td>
<td>Some of process data and records are not accessible to some of the relevant staff.</td>
<td>Organizational (Some software are out of date).</td>
</tr>
<tr>
<td>27</td>
<td>The reliability results of the systems of pipeline nondestructive testing and corrosion protection have not been updated for the last two years.</td>
<td>Physical (Delay in implementing of technical measurement at the agreed and defined interval).</td>
</tr>
<tr>
<td>28</td>
<td>The pipe integrity was not measured for the last three years.</td>
<td>Physical (Delay in implementing of technical measurement at the agreed and defined interval).</td>
</tr>
<tr>
<td>29</td>
<td>The durability of Zinc anodes used for corrosion protection was not measured, though their design life is expired two years ago.</td>
<td>Physical (Delay in implementing of technical measurement at the agreed and defined interval).</td>
</tr>
<tr>
<td>30</td>
<td>The results of process performance measurement is not sufficiently communicated.</td>
<td>Human (internal communication procedure needs improvement).</td>
</tr>
<tr>
<td>Limitation</td>
<td>Cause</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Limitation of data analysis to trends analysis, and it does not any other kinds of the qualitative analysis, like risk analysis or themes.</td>
<td>Human and organizational (shortage of training on use of data analysis techniques).</td>
<td></td>
</tr>
<tr>
<td>Cost of non conformities were not determined.</td>
<td>Human and physical (insufficient coordination between financial auditors and quality auditors).</td>
<td></td>
</tr>
<tr>
<td>Limitation of the previous internal audit data analysis to quantification without conclusion.</td>
<td>Human and organizational (shortage of training on use of data analysis techniques).</td>
<td></td>
</tr>
<tr>
<td>The departments have not identified and listed their problems periodically, but occasionally.</td>
<td>Organizational (ineffective internal audit and ineffective management review).</td>
<td></td>
</tr>
<tr>
<td>For the problems identified by the previous internal audits and certification audit, the departments have not applied any kind of the recognized techniques that are normally used to prevent the recurrence of the non conformities.</td>
<td>Human (shortage of training on problem solving tools).</td>
<td></td>
</tr>
<tr>
<td>The consequences of most of the outstanding non conformance reports raised during previous internal audits have not been determined.</td>
<td>Organizational (unavailability of Risk Management framework).</td>
<td></td>
</tr>
<tr>
<td>The five departments have not grouped their problems with their root causes, consequences and cost of their correction.</td>
<td>Human (shortage of training on risk management and their relevant techniques).</td>
<td></td>
</tr>
<tr>
<td>The all five departments have not identified the highest and lowest priority by score.</td>
<td>Human (shortage of training on assertion, materiality and criticality rating).</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>No evidence provided to show that the top management have taken decisions based on the analysis and evaluation of the previous audit findings.</td>
<td>Organizational and human (this is not procedural requirements and the top management were not trained on use of decision making tools).</td>
</tr>
<tr>
<td>40</td>
<td>None of the Decision Making Tools are used in making of decisions.</td>
<td>Organizational and human (this is not procedural requirements and the top management were not trained on use of decision making tools).</td>
</tr>
<tr>
<td>42</td>
<td>No recovery plan issued for some of the outstanding work that suddenly ceased, due to sudden departure of the overseas contractors, resulting from the political change in Libya.</td>
<td>Physical and human (leaving of subcontractor the country due to political change and shortage of training that is needed to enable the local manpower to handle these activities).</td>
</tr>
<tr>
<td>43</td>
<td>The training plan for 2017 is not interrelated to the output of management review report of 2016.</td>
<td>Organizational (The Training procedure does not emphasis on this relationship, the training is planned based on the departments requirement, and preferences).</td>
</tr>
<tr>
<td>44</td>
<td>Awareness of staff to risk assessment, risk management and risk analysis needs improvement</td>
<td>Organizational (Training plan does not include it).</td>
</tr>
<tr>
<td>Page</td>
<td>Text</td>
<td>Legend:</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>45</td>
<td>Some of technology changes were applied, but have not yet been reflected in their relevant operational procedure</td>
<td>Human= Manpower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organizational=System, Method, Measure, Software, and Procedures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical=Machine, Materials, and structure</td>
</tr>
<tr>
<td>46</td>
<td>No evidence provided to show that, before making of their decision, the department managers and top management have:</td>
<td>Organizational and human (this is not procedural requirements and the top management was not trained on use of data analysis techniques and decision making tools)</td>
</tr>
<tr>
<td></td>
<td>- Identified and analyzed the problem by use of one of the problem solving tools.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Developed and tested a potential solution by use of some techniques like Impact Analysis.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Measured how effective the test solution was. and analyzed whether it could be improved in any way.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Implemented the improved solution fully.</td>
<td>Appendix 5: Results of stage 2 audits. Source: the author</td>
</tr>
</tbody>
</table>
Appendix 6: Survey Form

University of Portsmouth, Portsmouth Business School, Postgraduate Centre, Portland Building, Portland Street, Portsmouth, PO1 3AH, UK, Tel: +44 (0)23 9284 4602
http://www.port.ac.uk/courses/business-and-management/prof-doc-business-administration-dba/

Survey Form

To: The Great Man made River Project Authority, Benghazi, Libya

Attention:

The Research Participants and Respondents

- Manager of Pipeline Non Destructive Inspection and Testing Department
- Manager of Corrosion Protection Department
- Manager of Technical Affair Department
- Manager of Operation and Maintenance Department
- Manager of Safety Department

Dear Sirs,

Thank you for reading this. I would like to invite you to take part in my research study by completing this questionnaire. It is entirely up to you whether you participate but your responses and participation would be valued. You have been identified as a potential respondent by the Researcher and you are the owner and operator of the process that will be subject for this research.

My study is assess GMRA evaluation methods and their efficiency for the purpose of developing an effective Audit Framework for this organisation which would enable them to predict for any future failure. The enclosed Survey Questionnaires Checklist includes the questions of the audits those are planned to be conducted at your departments, these questions are designed to verify and assess the effectiveness of the existing evaluation and measurements methods those are being implemented to evaluate of the organisations processes and are being followed by you in order to evaluate the processes and sub-processes of your departments. Your answers and feedback will be validated during face to face interview and audit those will be conducted at your premises by the Researcher, which means that the responses those will be assessed are the responses those will be collated after completing the audits.
Anonym is not applicable and will not be offered in this research.

Responses from completed questionnaires and the outputs of the interview will be collated for analysis; once this is complete the original questionnaires will be destroyed and superseded by my Report which will be classified as an internal audit report and then be controlled in accordance to GMRA Records Control Procedure and Internal Audit Procedure.

The results of the subject internal audits will be brought to your attention through your annual management review meeting for validation by other Managers. If you wish to learn more about the results of the research please inform the Researcher (e mail: up269009@myport.ac.uk)

With reference to the Resolution No. 269-2014 and to our conversation on the meeting that was held at GMRA Headquarter on 11 January 2016, herewith enclosed the Questionnaires Survey Checklist. It will be very highly appreciated if you complete this form and send it to the researcher before the date of audit and interview.

It is recommended to have your responses and feedback by end of July 2016, and then we will agree with you on the date of interview and audits, which is expected to be performed by end of this year.

It is your right to withdraw your data before data analysis begins, but not thereafter.

Your option for not participating and right to withdraw is offered to you and all other participants without suffering any detriment

**Questionnaire instructions**

The Survey Questionnaires comprise 7 Main Questions, and each one of them consists number of sub questions, and you are kindly requested to answer at least 60 % of the questions of each one of the 7 main questions, but it is preferred to answer 100 % of the questions, and you can clarify for any question during the interview.

These Questions checklist is designed to be used in the auditing and semi structured interviews, and it will be based on the concepts of process approach and risk based thinking,

You are kindly required to read and answer the below mentioned questions and when possible provide an evidence to support your answer. The evidence could be in the form of Official Document, controlled records, photos, and etc..

Following completing of your answers, the Researcher will interview and audit you based on these questions. all results will be discussed and agreed with you and members of your department (during audit closing meeting) and with the other departments managers (during the Annual Management Review Meeting) and then the findings will be categorised into;

- Potential non conformities, to be controlled by issue of Preventive Action Report (PAR)
- Existed non conformities, to be controlled by issue of Corrective Action Report (CAR)

You are kindly requested to answer the below mentioned questions, and to ensure you understand the questions correctly, you need to be aware of the Research Title, Purpose and Questions which are;
Study Title: Accommodating Of ISO 9001:2015 Concepts Within Auditing To Develop An Integrated Performance Evaluation Framework For The Great Man Made River Project Authority In Libya

RESEARCH QUESTION

- Whether the accommodating of the other ISO 9001:2015 Concepts and principles, i.e. Risk Based Thinking Concept, and other Problems Solving Tools i.e. 5 whys/ Root Cause Analysis within the Auditing by Process Approach Model will improve the Auditors capability for more prediction of future failures and for recognizing of more critical data, and to what extent?
- Whether this accommodating and combination will help the auditors to be Predictor, Diagnostician, problem solver, creative, coach and Strategist, and to what extent?

RESEARCH PURPOSE

- To develop an effective performance evaluation framework for the GMRP to deliver improved risk management?
- To identify the features those comprise the integrated performance evaluation framework for the GMRP?
- To identify the skills do Auditors require to be able to carry out an integrated performance evaluation of the GMRP?
- To assess to what extent, the providing the Auditors with these skills will help them and their organization to meet their objectives and overall goals

For assistance, you can contact the Researcher identified below:

Name of researcher: Omran Ahmad Abuazza

Up269009@myport.ac.uk

If the assistance is not as expected, or if the researcher is not helpful enough you can contact;

Name of Supervisors: Dr. Ashraf Labib and Dr. Barbara Savage

Ashraf.labib@port.ac.uk

Barbara.savage@port.ac.uk

You may need to perform an assessment at the activities and sub-processes of your department before answering the below questions, as this will enhance your understanding of the below questions.

This space include the Preliminary Auditing Framework (Appendix 1)

Thank you for completing the questionnaire please return it to the Researcher within Four Weeks of receiving
If you have any concerns regarding this research please contact the Researcher.

It is your right to withdraw your data before data analysis begins, but not thereafter.

Your phone number and e-mail would also be needed to be provided in the space provided below, as the researcher may need to contact you again in future for further clarification;

Phone Number:  
E-mail:

This part to be filled by the Auditor (Inside Researcher and Evaluator) after completing of the Audits

Analyzing Evidence

1- Have the organisation and each Process Owner shown adequate evidence of control?

2- Are the requirements of audit criteria satisfied? The audit criteria of Risk Management to be applied and anticipated at each audit

3- Have the organisation and each Process Owner shown adequate evidence of monitoring, measurement, analysis, evaluation and improvement?

4- Have objectives and targets been set. Are they being monitored and they being set?

If the answer to any of the above 4 questions is "No"

then a further question needs to be asked: To what level is the Process Owner, the customer or other interested parties (The owner of following process or affected process) are at risk

Verify Effectiveness:

To verify the effectiveness, ask this question, "are the Eight (8) Quality Principles working for each one of audited process?"

The Eight- (8) principles and concepts are embedded within the requirements of ISO 9001-2015. Therefore failure of compliance against the requirements will indicate failure to utilize the principles.

Researcher: Omran Abuazza, e-mail: up269009@myport.ac.uk  
Supervisor: Dr. Ashraf Labib, e-mail: Ashraf.labib@port.ac.uk  
DBA Course Director: Dr. Valerie Anderson, e-mail: Valerie.anderson@port.ac.uk
Appendix 7a: Ethics committee's email for the ethics approval

14/07/2016

Sharman:...Omran, Ashraf
Re: Ethical Review Application ref. E397
Report (DRAFT) of my research for your review.

Omran Abuazza

Dear Chris, Herewith enclosed the EC favourable opinion of my research, please advice what checks need to be done.

Omran Abuazza

Many thanks Dr. Asgard for your valuable comments, but bear in mind I am worrying about time for...)

Ashraf Labib

to Omran
Jul 25, 2016. View details

Dear Omran,

As far as annual report is concerned I am happy for you to proceed. Good luck for the next phase.

Best wishes,
Ashraf

Sent from my iPad
...
Appendix 7b: Ethics committee’s email for the ethics approval

Dear Oman,

Well done. This is excellent news that you managed to pass the Ethics process. Wish you all the best in the next phase.

Best wishes
Ashraf

Sent from Samsung Mobile on O2

Many thanks Dr. Ashraf, I will be sending you the draft of my research progress report by mid f next week.
Appendix 7c: Ethics committee’s email for the ethics approval

Dear Omran,

The Faculty Ethics Committee would like to extend its thanks to you for the clear way you have explained all the amendments you have made and is happy to issue a favourable opinion. We would like to thank you for your cooperative attitude over the several stages of amendments in this application, and we wish you good luck for your data collection.

Please refer to the attached letter.

Best wishes

Sharman Rogers

Business Services & Research Office
Portsmouth Business School
Portland Building, Portland Street
Portsmouth, Hampshire PO1 3AA UK
T: +44 (0)23 9284 4202

What we offer business:
http://www.port.ac.uk/portsmouth-business-school/find-out-more/
Services for Business
Research

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Re: Ethical Review Application ref. E397 [Omran Abuaaza]

14/07/2016

Re: Ethical Review Application ref. E397.
Report (2016) of my research for your ref...
Appendix 8: Ethics committee’s letter for the ethics approval

14th July 2016

Omran Ahmad Abuazza
DBA Student
Portsmouth Business School

Dear Omran

<table>
<thead>
<tr>
<th>Study Title:</th>
<th>Accommodating Of ISO 9001:2015 Concepts Within Auditing to Develop An Integrated Performance Evaluation Framework for The Great Man Made River Project Authority In Libya</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethics Committee reference:</td>
<td>E397</td>
</tr>
</tbody>
</table>

Thank you for submitting your documents for ethical review. The Ethics Committee was content to grant a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, revised in the light of any conditions set, subject to the general conditions set out in the attached document.

The favourable opinion of the EC does not grant permission or approval to undertake the research. Management permission or approval must be obtained from any host organisation, including University of Portsmouth, prior to the start of the study.
Summary of any ethical considerations

Documents reviewed

The documents reviewed by Dr Peter Scott [LCM] + PBS Ethics Committee

<table>
<thead>
<tr>
<th>Document</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethical Review application form</td>
<td>1</td>
<td>30 Apr 16</td>
</tr>
<tr>
<td>Survey doc</td>
<td>1</td>
<td>30 Apr 16</td>
</tr>
<tr>
<td>Participant Information Sheet</td>
<td>1</td>
<td>30 Apr 16</td>
</tr>
<tr>
<td>Invitation form</td>
<td>1</td>
<td>30 Apr 16</td>
</tr>
<tr>
<td>Ethical Review application form</td>
<td>2</td>
<td>2 Jun 16</td>
</tr>
<tr>
<td>Guidance Instructions</td>
<td>2</td>
<td>2 Jun 16</td>
</tr>
<tr>
<td>Appendices</td>
<td>2</td>
<td>2 Jun 16</td>
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<td>Ethical Review application form</td>
<td>3</td>
<td>28 Jun 16</td>
</tr>
<tr>
<td>Survey doc</td>
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</tr>
<tr>
<td>Participant Information Sheet</td>
<td>3</td>
<td>28 Jun 16</td>
</tr>
<tr>
<td>Invitation form</td>
<td>3</td>
<td>28 Jun 16</td>
</tr>
<tr>
<td>Participant 1</td>
<td>1</td>
<td>28 Jun 16</td>
</tr>
<tr>
<td>Translation doc</td>
<td>1</td>
<td>28 Jun 16</td>
</tr>
<tr>
<td>Table to show how response to amendments addressed</td>
<td>1</td>
<td>28 Jun 16</td>
</tr>
<tr>
<td>Ethical Review application form</td>
<td>4</td>
<td>11 Jul 16</td>
</tr>
<tr>
<td>Survey doc</td>
<td>4</td>
<td>11 Jul 16</td>
</tr>
<tr>
<td>Participant Information Sheet</td>
<td>4</td>
<td>11 Jul 16</td>
</tr>
<tr>
<td>Invitation form</td>
<td>4</td>
<td>11 Jul 16</td>
</tr>
<tr>
<td>Participant 1</td>
<td>2</td>
<td>11 Jul 16</td>
</tr>
<tr>
<td>Resolution translation</td>
<td>1</td>
<td>11 Jul 16</td>
</tr>
<tr>
<td>Table to show how FEC comments addressed</td>
<td>2</td>
<td>11 Jul 16</td>
</tr>
</tbody>
</table>
Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements set out by the University of Portsmouth.

After ethical review

Reporting and other requirements

The attached document acts as a reminder that research should be conducted with integrity and gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Notification of serious breaches of the protocol
- Progress reports
- Notifying the end of the study

Feedback

You are invited to give your view of the service that you have received from the Faculty Ethics Committee. If you wish to make your views known please contact the administrator Christopher Martin.

Please quote this number on all correspondence: E397

Yours sincerely and wishing you every success in your research

Chair

Email:

“After ethical review – guidance for researchers”

Enclosures:

Copy to:

Prof. Ashraf Labib

Appendix 1
After ethical review – guidance for researchers

This document sets out important guidance for researchers with a favourable opinion from a University of Portsmouth Ethics Committee. Please read the guidance carefully. A failure to follow the guidance could lead to the committee reviewing and possibly revoking its opinion on the research.

It is assumed that the research will commence within 3 months of the date of the favourable ethical opinion or the start date stated in the application, whichever is the latest.

The research must not commence until the researcher has obtained any necessary management permissions or approvals – this is particularly pertinent in cases of research hosted by external organisations. The appropriate head of department should be aware of a member of staff’s research plans.

If it is proposed to extend the duration of the study beyond that stated in the application, the Ethics Committee must be informed.

If the research extends beyond a year then an annual progress report must be submitted to the Ethics Committee.

When the study has been completed the Ethics Committee must be notified.

Any proposed substantial amendments must be submitted to the Ethics Committee for review. A substantial amendment is any amendment to the terms of the application for ethical review, or to the protocol or other supporting documentation approved by the Committee that is likely to affect to a significant degree:

(a) the safety or physical or mental integrity of participants
(b) the scientific value of the study
(c) the conduct or management of the study.

A substantial amendment should not be implemented until a favourable ethical opinion has been given by the Committee.
Researchers are reminded of the University’s commitments as stated in the Concordat to Support Research Integrity viz:

- maintaining the highest standards of rigour and integrity in all aspects of research
- ensuring that research is conducted according to appropriate ethical, legal and professional frameworks, obligations and standards
- supporting a research environment that is underpinned by a culture of integrity and based on good governance, best practice and support for the development of researchers
- using transparent, robust and fair processes to deal with allegations of research misconduct should they arise
- working together to strengthen the integrity of research and to reviewing progress regularly and openly

In ensuring that it meets these commitments the University has adopted the UKRIO Code of Practice for Research. Any breach of this code may be considered as misconduct and may be investigated following the University Procedure for the Investigation of Allegations of Misconduct in Research.

Researchers are advised to use the UKRIO checklist as a simple guide to integrity.
Appendix 9  Invitation Forms

University of Portsmouth, Portsmouth Business School, Postgraduate Centre, Portland Building, Portland Street, Portsmouth, PO1 3AH, UK, Tel: +44 (0)23 9284 4602
http://www.port.ac.uk/courses/business-and-management/prof-doc-business-administration-dba

Study Title: Accommodating Of ISO 9001:2015 Concepts Within Auditing To Develop An Integrated Performance Evaluation Framework For The Great Man Made River Project Authority In Libya

REC Ref No: ...............................................................

To: The Great Man made River Project Authority, Benghazi, Libya

Attention: The Research Participants and Respondents

- Departments Managers of Pipeline Non Destructive Inspection and Testing / Corrosion Protection / Technical Affair / Operation and Maintenance Department / Safety

Dear Potential Participant,

This form needs to be read in conjunction with the attached Survey Form and Participant Information Sheet

This research has already been approved by your organization (The Great Man made River Project Authority “GMRA”). There is an official Resolution issued (No. 269:14 dated on 10 August 2014, signed by the Chairman of GMRA Mr. Abdulnaser Bubtaina) for purpose of authorizing myself (the Head of GMRA ISO Committee Mr. Omran Abuazza at GMRA and who is Student at University Of Portsmouth UK) to start a research with Portsmouth University, in the subject of “Evaluation and Developing of Performance of GMRA Processes), and based on this Resolution the Researcher (Mr. Abuazza) will perform number of audits and interviews at your departments which have been chosen to represents the research samples, as explained in the attached Survey Form and Participants Information Sheet. A copy of this Resolution is attached.

The researcher will be Inside Researcher (who will be the reviewer, evaluator and Auditor at the same time) and the participants will be yourselves (the departments managers those are normally subjected to internal auditing during their routine work).

- Please confirm your acceptance or non acceptance for this invitation to the researcher email identified below

- Taking part of this research is voluntary, and it is up to you to decide to join this study. If you decline to participate, or if you later decide to withdraw your participation, we will approach your deputy or member of your department staff that your Chairman recommends. and we will confirm with him/her the results of your responses and interview prior to beginning of data analysis stage.

- Many thanks to you for taking the time to read the information sheet regardless of your decision to participate or not. If you decide to participate you will be given a copy of the information sheet to keep and your consent will be sought.
Appendix 10: Participant Information Sheet

Study Title:


REC Ref No: ..............................................................................

To: The Great Man made River Project Authority, Benghazi, Libya

Attention:

The Research Participants and Respondents

- Manager of Pipeline Non Destructive Inspection and Testing Department
- Manager of Corrosion Protection Department
- Manager of Technical Affair Department
- Manager of Operation and Maintenance Department
- Manager of Safety Department
Dear Sirs,

We would like to invite you to take part in our research study. Before you decide we would like you to understand why the research is being done and what it would involve for you. Talk to others about the study if you wish. Ask us if there is anything that is not clear.

Background

The analysis of GMRA audits those are conducted by accommodating of the techniques of the Process Approach and FMEA, revealed the followings:

- The audit criteria of the existing GMRA Risk Management was not effective for determining the new threats, risks and opportunities resulted from the last political change in Libya
- These audits have failed to discover the problems and threats those are outside the audits scope, criteria and documented KPIs

For these reasons it is decided to conduct this research to assess;

- Whether the accommodating of the other ISO 9001:2015 Concepts and principles, i.e. Risk Based Thinking Concept, and other Problems Solving Tools i.e. 5 whys/ Root Cause Analysis within the Auditing by Process Approach Model will improve the Auditors capability for more prediction of future failures and for recognizing of more critical data, and to what extent?
- Whether this accommodating will help the auditors to be Predictor, Diagnostician, Problem Solver, Creative, Coach and Strategist, and to what extent?

What is the purpose of the study?

To develop an effective performance evaluation framework for the GMRP to deliver improved risk management?

- To identify the features those comprise the integrated performance evaluation framework for the GMRP?
- To identify the skills do Auditors require to be able to carry out an integrated performance evaluation of the GMRP?
- To assess to what extent, the providing the Auditors with these skills will help them and their organization to meet their objectives and overall goals

Why have you been invited?

This research will be conducted at your organisation (GMRA) which will be represented by the 5 Department those cover the main and core business processes of the organisation, and which are responsible for the processes and component of the subject research that includes the measurement, monitoring, evaluation, risk management, project integrity and organisational sustainability. These departments are:

Corrosion Protection Dept./ Pipeline Non Destructive Inspection Techniques / Technical Affair DEPT. / Operation & Maintenance Dept./ Quality and Safety Dept. They are out of 12 depts. form the whole
organisation. They are located at the headquarter and have all records and data of the organisation. The department which you manage is one of them.

The Five chosen Departments will be represented by their Managers, who are supposed to be fully aware of the details, problems and threats of their departments and who can get the necessary support from their staff easily, these 5 departments managers were chosen because they comprise the most important departments who forms the members of the emergency committee, who are fully responsible for organisation management and operation during emergencies. Probability Sampling: Stratified Systematic Random Sampling is used here.

These managers of these 5 departments including yourself will be the participants in this research and they will act as the Auditees and Respondents.

**Do you have to take part?**

Taking part of this research is voluntary, and it is up to you to decide to join this study. You would not feel pressurized and will not be rewarded for your participation, because it will form part of your routine normal activities, which require all managers to participate in the internal audits conducted at their departments and to provide the Internal Auditors by all answers and audit evidences needed, but this does not preclude your individual right to decline or to withdraw.

Also the organisation rules and its audit procedure give an assurance to Auditees that they will not suffer harm or feel obligated for any non conformities detected during and after audits.

It is of the rights of all participants to withdraw their data before data analysis begins, but not thereafter.

The option for not participating and right to withdraw is offered to all participants without suffering any detriment.

This research will not be the “property” of GMRA even though it is take place in its workplace. The Reseacher undertaking research in the workplace do so as UoP students not as employees of GMRA.

You should not feel any obligation to participate as part of you work duties, but you will be invited officially by sending them the Invitation Form, and it is up to you to accept it or not.

**What will happen to me if I take part?**

You will involved in the research during the following periods;

- 3 days to complete the Survey Form (Auditing Questionnaires Checklist) and to conduct self-auditing
- 2 days to be audited and interviewed
- 3 working days to attend the Management Review Meeting to confirm your responses and feedback by other managers and staff
- 4 working days to attend three workshops
- The time you need to prepare the audit evidences those will support your answers and responses

So the total of your participation will be about Ten 14 working days

The total period the research will be 3 years, and you will be informed of the progress if you wish.

The audit and interview of the subject research will not involve any video or audio-taping, and the research data which include the audits reports and its associated documents will be recorded based on the Organisation’s Document Control Procedure, which define how to control the hardcopies and softcopies of such kinds of documents. Each document of them will be numbered by a unique number, revision number and also will entitled, dated, and signed by the Auditor and Auditees, and then the completed documents will be controlled and stored in accordance to the storage requirements of the custodian GMRA and the PoU.

There is already a Resolution issued by your Chairman. This Resolution is attached, and the clause 3 of this resolution No. 269-2014 requires the Researcher to conduct the audits and require the Participants to cooperate with the researcher. Your participation will part of your normal and routine activities, as you are already aware any department within GMRA organisation will be normally subjected to internal audit and the inside researcher is being working with the Custodian as internal auditor. Although the Resolution requires the participants to cooperate with the Researcher but this does not preclude your right to decline or to withdraw.

As the researcher is an Inside Researcher, we have to ensure that there is no conflict of interest or duties between his task as Student and his task as employee at your organisation where the research will be taken place. The research, with a favourable ethical opinion, will be undertaken in the name of the University of Portsmouth.

The research will not be the “property” of GMRA even though it is take place in its workplace.

The Researcher undertaking research in the workplace do so as UoP students not as employees of GMRA.

The participants should not feel any obligation to participate as part of their work duties, but they will be invited officially by sending them the Invitation Form, regardless of the issue of GMRA Resolution that include the organisation Consent. This is to make sure that there is no any threatening or coercion to any one of the participants.

Your feedback, answers and responses to the Survey Questionnaires Checklist will be very highly appreciated.
You may also need to complete or sign the consent form

**Expenses and payments**
No payment or expenses will be paid to you, neither to the Researcher, except salaries

**What will you have to do?**
Completing questionnaire and answer the questions raised by the Researcher during the auditing / Interview, and also provide any evidence which support your answer

**What are the possible disadvantages and risks of taking part?**
By the tasks identified above, it will be no any kind of risk or threats.

As you are already part of GMRA Staff and as the scope of research is already part of the routine work of you and researcher, and as your organisation (GMRA) covers all of the employees including you by comprehensive insurance all risks, which includes; life insurance, health insurance, insurance against accidents/injuries, insurance against risks and life insurance, this insurance covers also the non stability of political situation.

Also, By the Risk Management of GMRA Organisation, it is assured that you have no risk in your participation in this research.

This is to confirm that it will be no risk or disadvantages of your participation at all

**What are the possible benefits of taking part?**
Getting more experience on Auditing and learning more on the subject of (Performance Evaluation) and contribute in developing of new Auditing Framework for GMRA, which would be an added value to all staff including Managers and Auditors

**Will my taking part in the study be kept confidential?**
Confidentiality is guaranteed by committing for not publishing or reproducing any of the audit results to any third party unless approved by the custodian (GMRA). The same confidentiality which is normally given by the certification body when they conduct audit at any organisation is given

This research does not include any of personal data. Anonymisation will not be offered. The Participants will be named by their personal names and titles.

Although the Custodian has no objection for the university to publish this work, but I commit not to publish and/or reproduce any part of the research work to any third party, unless permitted by the Custodian and University.
Your responses and the audit evidences those will be received from the you will be considered as an intellectual properties and therefore will not be reproduced or given to any third party unless permitted by your organisation.

This research does not include any of personal data or sensitive data. Anonymisation will not be offered.

The Researcher’s copy of the raw data will be retained until the degree has been awarded, on occasion examiners wish to access raw data. Once the degree has been awarded all raw data will be destroyed.

The data that include; the audits reports, the results of data analysis and evaluation, and the Research annual progress reports will be kept and also stored in the N Drive and ICould (Password-protected) in accordance to the University’s data storage requirements, to authorize an access to them by the Researcher, Supervisors, Examiners and University’s Quality Auditor if requested.

At the same time the completed thesis will be retained in accordance with UoP Retention schedule in accordance with:

- UoP Guidance on retaining data
- UoP Library - Research data: Life cycle and archiving

The above data will be retained and stored without anonymisation, which will not be required for the following reasons;

- The main research methodology is (Auditing) which would be better to be performed without anonymisation

- The organisation and participants have no objection to be named in the research work and have no objection for this work to be published. The organization has already explicitly given its consent to the data to be collected in a non-anonymous fashion. The participants have already given their consent during the meeting with them held on January 2016 to the data to be collected in a non-anonymous fashion, and this will be reflected in the consent form

- The research will include also face to face interview and management Review Meeting that will be attended by all managers including participants

What will happen if you don’t want to carry on with the study?
If you decline to participate, or if you later decide to withdraw your participation, we will approach your deputy or member of your department staff that your Chairman recommends and we will confirm with him/her the results of your responses and interview prior to beginning of data analysis stage, and we will deal with the data received from you based on your request, i.e. if you want to cancel it, we will cancel it, and then we will repeat the same procedure with your deputy or the other authorised person.

What if there is a problem?

Our study is searching for non conformities related your organisation’s performance evaluation, in order to correct them and recommend to you how to improve it. We are not searching for the problems. It is normal for any organisation to have non conformities, once this organisation works. All of the non conformities have to be agreed and approved by the participants before documenting them in the Research Report. If you have any complaints or enquiries, please do not hesitate to contact us at the addresses shown in the header and footer of this page.

Your complaints will be considered in accordance to the University Complaints Procedure. Also you can raise any complaints to the top management (i.e. Chairman of your organisation).

What will happen to the results of the research study?

The Researcher’s copy of the raw data will be retained until the degree has been awarded, on occasion examiners wish to access raw data. Once the degree has been awarded all raw data will be destroyed.

The data that include; the audits reports, the results of data analysis and evaluation, and the Research annual progress reports will be kept and also stored in the N Drive and ICould (Password-protected) in accordance to the University’s data storage requirements, to authorize an access to them by the Researcher, Supervisors, Examiners and University’s Quality Auditor if requested.

At the same time the completed thesis will be retained in accordance with UoP Retention schedule in accordance with:

- UoP Guidance on retaining data

- UoP Library - Research data: Life cycle and archiving
Who is organising and funding the research?

The study is organised by Mr. Omran Abuazza who work at your organisation as well, and it will be part of his Professional Doctorate at University of Portsmouth.

The Research will be funded by the researcher himself, but each invoice of the annual tuition fee will be reimbursed to him by the Custodian (The Great Man made River Project Authority). The Researcher will not receive any financial support for the research, authorship, and/or publication of any part of this research. Nobody (Neither Researcher nor Participants) will receive any payment other than salary. The research will be part of their routine normal activities.

Who has reviewed the study?

The Research in the University of Portsmouth is looked at by independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given a favourable opinion by the Research Ethics Committee.‘

Further information and contact details

Please find attached 1 of this Enclosure which include the Survey Form, which include the following information:

1. General information about research.

2. Specific information about this research project.

Concluding statement

Many thanks to you for taking the time to read the information sheet regardless of your decision to participate or not. If they decide to participate you will be given a copy of the information sheet to keep and your consent will be sought through the Resolution No. 269-2014 and consent forms.
Appendix 11a

CONSENT FORM


Name and Contact Details of Researcher(s): Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk

Name and Contact Details of Supervisor (if relevant): Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk

Ethics Committee Reference Number: ------

1. I confirm that I have read and understood the information sheet dated.15/06/2-16 (version-03) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

3. I understand that data collected during this study, could be requested and looked at by regulatory authorities. I give my permission for any authority, with a legal right of access, to view data which might identify me. Any promises of confidentiality provided by the researcher will be respected.

4. (If appropriate) I understand that the results of this study may be published and / or presented at meetings or academic conferences, and may be provided to research commissioners or funders, I give my permission for my data to be disseminated in this way.

5. (If appropriate) I agree to the data I contribute being retained for any future research that has been approved by a Research Ethics Committee.

6. I agree to take part in the above study.

Name of Participant: Khalifa Nawaa Date: 15 June 2016 Signature: KN

Name of Person taking Consent: Omran Abuazza Date: Signature: OA

Note: When completed, one copy to be given to the participant, one copy to be retained in the study file

FURTHER ADDITIONAL CLAUSES ARE PROVIDED OVERLEAF

Additional Clauses
With reference to GMRA Resolution No. 269:2014 and to the meeting that was held at GMRA Benghazi on January 2016 between the Researcher and participants including you, I confirm that I have given my consent to the data to be collected in a non-anonymous fashion.

I consent to verbatim quotes being used in publications.

I agree to be named as a participant and referred to accordingly.

I would like to receive further information about the results of the study.

Note:

It is your right to withdraw your data before data analysis begins, but not thereafter.

Your option for not participating and right to withdraw is offered to you and all other participants without suffering any detriment.

University of Portsmouth, Portsmouth Business School, Postgraduate Centre, Portland Building, Portland Street, Portsmouth, PO1 3AH, UK, Tel: +44 (0)23 9284 4602
http://www.port.ac.uk/courses/business-and-management/prof-doc-business-administration-dba/

Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk
Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk
DBA Course Director: Dr. Valerie Anderson, e mail: Valerie.anderson@port.ac.uk

Consent Form-Guidance and Template Version 1.0-September 2015 David Carpenter – University Ethics Advisor
Appendix 11b

CONSENT FORM


Name and Contact Details of Researcher(s): Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk

Name and Contact Details of Supervisor (if relevant): Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk

Ethics Committee Reference Number: ------

7. I confirm that I have read and understood the information sheet dated 15/06/2-16 (version-03) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

8. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

9. I understand that data collected during this study, could be requested and looked at by regulatory authorities. I give my permission for any authority, with a legal right of access, to view data which might identify me. Any promises of confidentiality provided by the researcher will be respected.

10. (If appropriate) I understand that the results of this study may be published and / or presented at meetings or academic conferences, and may be provided to research commissioners or funders, I give my permission for my data to be disseminated in this way.

11. (If appropriate) I agree to the data I contribute being retained for any future research that has been approved by a Research Ethics Committee.

12. I agree to take part in the above study.

Name of Participant: Naji Elkilili Date: 15 June 2016 Signature: AB
Name of Person taking Consent: Omran Abuazza Date: Signature: OA

Note: When completed, one copy to be given to the participant, one copy to be retained in the study file

FURTHER ADDITIONAL, OPTIONAL CLAUSES ARE PROVIDED OVERLEAF

Additional Clauses
With reference to GMRA Resolution No. 269:2014 and to the meeting that was held at GMRA Benghazi on January 2016 between the Researcher and participants including you, I confirm that I have given my consent to the data to be collected in a non-anonymous fashion.

I consent to verbatim quotes being used in publications.

I agree to be named as a participant and referred to accordingly.

I would like to receive further information about the results of the study.

Note:

It is your right to withdraw your data before data analysis begins, but not thereafter.

Your option for not participating and right to withdraw is offered to you and all other participants without suffering any detriment.

University of Portsmouth, Portsmouth Business School, Postgraduate Centre, Portland Building, Portland Street, Portsmouth, PO1 3AH, UK, Tel: +44 (0)23 9284 4602
http://www.port.ac.uk/courses/business-and-management/prof-doc-business-administration-dba/

Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk
Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk
DBA Course Director: Dr. Valerie Anderson, e mail: Valerie.anderson@port.ac.uk

Consent Form-Guidance and Template Version 1.0-September 2015 David Carpenter – University Ethics Advisor
Appendix 11c

CONSENT FORM


Name and Contact Details of Researcher(s): Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk

Name and Contact Details of Supervisor (if relevant): Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk

Ethics Committee Reference Number: ------

13. I confirm that I have read and understood the information sheet dated.15/06/2-16 (version-03) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

14. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

15. I understand that data collected during this study, could be requested and looked at by regulatory authorities. I give my permission for any authority, with a legal right of access, to view data which might identify me. Any promises of confidentiality provided by the researcher will be respected.

16. (If appropriate) I understand that the results of this study may be published and / or presented at meetings or academic conferences, and may be provided to research commissioners or funders, I give my permission for my data to be disseminated in this way.

17. (If appropriate) I agree to the data I contribute being retained for any future research that has been approved by a Research Ethics Committee.

18. I agree to take part in the above study.

Name of Participant: Ali Zoghbia Date: 15 June 2016 Signature: AT

Name of Person taking Consent: Omran Abuazza Date: Signature: OA

Note: When completed, one copy to be given to the participant, one copy to be retained in the study file

FURTHER ADDITIONAL, OPTIONAL CLAUSES ARE PROVIDED OVERLEAF

Additional Clauses

Page 217  Development of an Auditing Framework by Integrating ISO 9001:2015 QMPs within Auditing
With reference to GMRA Resolution No. 269:2014 and to the meeting that was held at GMRA Benghazi on January 2016 between the Researcher and participants including you, I confirm that I have given my consent to the data to be collected in a non-anonymous fashion.

I consent to verbatim quotes being used in publications.

I agree to be named as a participant and referred to accordingly.

I would like to receive further information about the results of the study.

Note:

It is your right to withdraw your data before data analysis begins, but not thereafter.

Your option for not participating and right to withdraw is offered to you and all other participants without suffering any detriment.

University of Portsmouth, Portsmouth Business School, Postgraduate Centre, Portland Building, Portland Street, Portsmouth, PO1 3AH, UK, Tel: +44 (0)23 9284 4602
http://www.port.ac.uk/courses/business-and-management/prof-doc-business-administration-dba/

Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk
Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk
DBA Course Director: Dr. Valerie Anderson, e mail: Valerie.anderson@port.ac.uk

Consent Form—Guidance and Template V 1.0—September 2015
David Carpenter – University Ethics Advisor
Appendix 11d

CONSENT FORM


Name and Contact Details of Researcher(s): Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk

Name and Contact Details of Supervisor (if relevant): Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk

Ethics Committee Reference Number: ------

19. I confirm that I have read and understood the information sheet dated 15/06/2-16 (version-03) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

20. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

21. I understand that data collected during this study, could be requested and looked at by regulatory authorities. I give my permission for any authority, with a legal right of access, to view data which might identify me. Any promises of confidentiality provided by the researcher will be respected.

22. (If appropriate) I understand that the results of this study may be published and / or presented at meetings or academic conferences, and may be provided to research commissioners or funders, I give my permission for my data to be disseminated in this way.

23. (If appropriate) I agree to the data I contribute being retained for any future research that has been approved by a Research Ethics Committee.

24. I agree to take part in the above study.

Name of Participant: Tarek Bosnaina Date: 15 June 2016 Signature: TB
Name of Person taking Consent: Omran Abuazza Date: Signature: OA

Note: When completed, one copy to be given to the participant, one copy to be retained in the study file
FURTHER ADDITIONAL, OPTIONAL CLAUSES ARE PROVIDED OVERLEAF

Additional Clauses

With reference to GMRA Resolution No. 269:2014 and to the meeting that was held at GMRA Benghazi on January 2016 between the Researcher and participants including you, I confirm that I have given my consent to the data to be collected in a non-anonymous fashion

I consent to verbatim quotes being used in publications

I agree to be named as a participant and referred to accordingly.

I would like to receive further information about the results of the study

Note:

It is your right to withdraw your data before data analysis begins, but not thereafter.

Your option for not participating and right to withdraw is offered to you and all other participants without suffering any detriment

University of Portsmouth, Portsmouth Business School, Postgraduate Centre, Portland Building, Portland Street, Portsmouth, PO1 3AH, UK, Tel: +44 (0)23 9284 4602
http://www.port.ac.uk/courses/business-and-management/prof-doc-business-administration-dba/

Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk
Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk
DBA Course Director: Dr. Valerie Anderson, e mail: Valerie.anderson@port.ac.uk

Consent Form-Guidance and Template Version 1.0-September 2015 David Carpenter – University Ethics Advisor
Appendix 11e

CONSENT FORM


Name and Contact Details of Researcher(s): Researcher: Omran Abuazza, e mail: up269009@myport.ac.uk

Name and Contact Details of Supervisor (if relevant): Supervisor: Dr. Ashraf Labib, e mail: Ashraf.labib@port.ac.uk

Ethics Committee Reference Number: ------

25. I confirm that I have read and understood the information sheet dated 15/06/2-16 (version-03) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

26. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

27. I understand that data collected during this study, could be requested and looked at by regulatory authorities. I give my permission for any authority, with a legal right of access, to view data which might identify me. Any promises of confidentiality provided by the researcher will be respected.

28. (If appropriate) I understand that the results of this study may be published and / or presented at meetings or academic conferences, and may be provided to research commissioners or funders, I give my permission for my data to be disseminated in this way.

29. (If appropriate) I agree to the data I contribute being retained for any future research that has been approved by a Research Ethics Committee.

30. I agree to take part in the above study.

Name of Participant: Haitham Alsaltani Date: 15 June 2016 Signature: FH

Name of Person taking Consent: Omran Abuazza Date: Signature: OA

Note: When completed, one copy to be given to the participant, one copy to be retained in the study file

____________________________________________________________________________________
FURTHER ADDITIONAL, OPTIONAL CLAUSES ARE PROVIDED OVERLEAF
Additional Clauses

With reference to GMRA Resolution No. 269:2014 and to the meeting that was held at GMRA Benghazi on January 2016 between the Researcher and participants including you, i confirm that i have given my consent to the data to be collected in a non-anonymous fashion

Yes

I consent to verbatim quotes being used in publications

Yes

I agree to be named as a participant and referred to accordingly.

Yes

I would like to receive further information about the results of the study

Yes

Note:

It is your right to withdraw your data before data analysis begins, but not thereafter.

Your option for not participating and right to withdraw is offered to you and all other participants without suffering any detriment
Appendix 12a: The translation of Resolution No. 269-2014 concerning the Consent for the Research

The Great Man made River Project Authority

Resolution No. 269-2014 Concerning the Approval for Sponsorship of Research

With reference to:
- Law No. 11-1983
- GMRA Development and Training Procedure
- Government Resolution No. 68-2011
- Letter of Proposal issued by the Head of ISO Committee, Mr. Omran Ahmad Abuazza (Document No. 3413/2014 dated on 16/06/2014)

The Chairman Decided

Clause 1

Sponsoring the Research that was proposed by GMRA Head of ISO Committee concerning (Review and Developing of Auditing Technique) under the supervision of University of Portsmouth – UK via paying the Tuition Fee needed for the Researcher (by a total amount not exceeding 24,800 GBP)

Clause 2

During the Research Period, the Researcher has to provide to GMRA Staff number of short training courses about the research subject

Clause 3

The main Research Method will be the Internal Auditing, which need to be conducted by the Researcher at the selected departments managers, who should allow him to conduct these audits easily and provide him by all help and data needed

Clause 4

All staff are required to implement this research from data of issue

Name, Signature and Stamp of GMRA Chairman, Mr. Abdulnaser Bubtaina
Appendix 12b: Custodian Resolution

[Image of the resolution document]
Appendix 12b, page 2: Custodian Resolution
Appendix 13a: The email of the award of PECB best auditor that was awarded to the author

PECB Auditor of the Year 2016

Tim Rama

3/27/17

to omranabuazza@yahoo.com

Mar 27 at 15:01

Dear Omran,

Greetings from PECB.

We are organizing the first international conference called “PECB Standard Insights Conference” in Montreal, Canada from 28th to 30th of June 2017. PECB Insights Conference ([https://pecb.com/conferences/](https://pecb.com/conferences/)) is very important for PECB as it will bring together PECB partners, experts, practitioners, and influencers to continue elevating our professional competencies. Exclusively, this year the PECB Insights Conference will specialize in Information Security Management, Auditing & Management System Certification, Governance, Risk, and Compliance.

After careful assessment of PECB Auditors specializing in EMS, we have selected you as best auditor of the year 2016 for EMS. I invite you to accept your award of EMS Auditor of the Year 2016 and celebrate with us by attending the conference in Montreal. Your participation in this event is mandatory to take the price, which would not only be an outstanding sharing opportunity amongst some of the most qualified professionals in these specific industries but would also serve as an excellent networking opportunity. Following your experience and professional qualifications we would be delighted to have you present.

Expecting for a reply of interest soon from you, your presence would certainly dignify our event.

Best regards,

Tim Rama

Commercial Director
Appendix 13b: The award of PECB best auditor that was awarded to the author
Appendix 14: The evidence of dissemination of the research work through publication in the international journal of quality and reliability management (IJJQM)

Dear Author(s)

It is a pleasure to inform you that your manuscript titled Development of a Conceptual Auditing Framework by Integrating ISO 9001 Principles within Auditing (UQRM-06-2018-0154) has passed initial screening and is now awaiting reviewer selection. The manuscript was submitted by Mr. Omran Abuazza with you listed as a co-author. As you are listed as a co-author please log in to https://mc.manuscriptcentral.com/ijjrm and check that your account details are complete and correct, these details will be used should the paper be accepted for publication.

Yours sincerely,
Ton Van der Wiele
Editorial Assistant, International Journal of Quality & Reliability Management
vanderwiele65@gmail.com
Appendix 15: Passing the Advanced Audit Technique exam

Dear Omran,

I am delighted to inform you that you have successfully passed the Advanced Auditing Techniques Exam! Your exam number is: XAAT-66.

Please be informed that our Auditor Program Manager will get back to you regarding your MS Auditor recertification process.

Additionally, we have a PECB group in LinkedIn. If you haven’t already joined our LinkedIn group, please click on http://www.linkedin.com/e/gia/1150487 to join it. Shortly after you apply, you will be accepted. Joining this LinkedIn group is not compulsory, but it’s a great opportunity to make contacts and be informed about opportunities.

For any difficulties, please contact us at https://www.pecb.com/customer

Best regards,
Sherif Mehmeti
References


AICPA/GAAS: American institute of Certified Public Accountant: Generally Accepted Auditing Standards.


ASQ (2015), *ASQ Glossary*.


Aven, anderson, Cox, Droguett, Greenberg, Guikema, Kroger, McComas, Renn, Thompson & Zio, (2016). *Society of Risk Analysis ‘SRA’*.


Page 231   Development of an Auditing Framework by Integrating ISO 9001:2015 QMPs within Auditing


ISO 27008:2011, International Organization of Standardization (ISO), Guidance for auditors on information security management system “ISMS” control


Read, M. (2015), Action Research – a research approach which aims at both taking actions and creating knowledge or theory (Coghlan and Brannick, 2007). *University of Portsmouth DBA learning session.*


Russell, J.P. (2004), 12 Ways To Add Value to Audits, *ASQ Quality Progress (June)*.


SRA. (2017). The draft of the list of core subject of Risk Analysis Field (Draft 17 November 2017). *Society of Risk Analysis-Group of Risk Analysis*.


