Developing and Assessing the Drivers of Usage of Computer-Assisted-Audit-Techniques (CAATs) and the factors that impact Audit Quality perceptions in Government Internal Audit

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Technological University Dublin

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Developing and Assessing the Drivers of Usage of Computer-Assisted-Audit-Techniques (CAATs) and the factors that impact Audit Quality perceptions in Government Internal Audit

Ashraf Alhabsi - BSc

December 2017

Submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in the College of Business, Dublin Institute of Technology

Supervisors:

Professor Joseph Coughlan and Dr. Irene Neville
Declaration

I certify that this thesis which I now submit for examination for the award of Doctor of Philosophy, is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

This thesis was prepared according to the regulations for postgraduate study by research of the Dublin Institute of Technology and has not been submitted in whole or in part for an award in any other Institute or University.

The work reported on in this thesis conforms to the principles and requirements of the Institute's guidelines for ethics in research.

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Signature: ___________________________ Date: _____________________
Material published from this work

Acknowledgements

In performing and completing my thesis, I acquired the assistance and guidance from some esteemed people who deserve my utmost gratitude. The completion of this thesis is of much pleasure to me, and I would like to take this opportunity to offer my sincere thanks to the following:

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Abstract

The availability of internal audit specific technologies is rapidly increasing in the internal audit environment. These technologies enable internal auditors to perform a range of internal audit functions including data extraction, querying, manipulation, summarisation and analytical tasks (Kim, Mannino, & Nieschwietz, 2009). Despite this increased availability, current utilisation rates of these tools by internal audit departments remains relatively low (Kim et al., 2009), and research concerning the factors influencing technology adoption intention in an internal audit setting is lacking (Mahzan & Lymer, 2014). Thus, it is crucial to examine the factors influencing technology adoption among internal auditors. Furthermore, studies that have examined technology adoption in an internal audit context typically use the Unified Theory of Acceptance and Use of Technology (Curtis & Payne, 2008; Mahzan & Lymer, 2014; Venkatesh & Davis, 2000) and the Technology Acceptance Model (Gonzalez, Sharma, & Galletta, 2012; Kim et al., 2009), in the absence of a technology adoption model specific to the internal audit setting.

To address the current gap in the literature, this research adapts the ‘Technological, Organisational, Environmental and Individual’ (T-O-E-I) Framework to predict the technology adoption intention of internal auditors in the context of government internal audit. Audit quality is the primary goal of the audit function (Omonuk & Oni, 2015). Although technology adoption can positively influence audit quality (Vasarhelyi & Romero, 2014), auditors are nevertheless reluctant to adopt technology (Kim et al., 2009). From existing theoretical frameworks on technology adoption, the main factors that influence the technology adoption intention of internal auditors include perceived usefulness, ease of use, organisational support, and top management support (Vasarhelyi & Romero, 2014; Venkatesh & Davis, 2000). However, these frameworks are not specific to the internal audit setting, and therefore do not consider the factors that are only present in an internal audit environment. To this end, this research developed an Audit Quality Framework which examines the factors underpinning audit quality.

The population for this research consisted of internal auditors in three government audit organisations in Oman namely, the State Audit Institution (SAI), the Royal Court Affairs (RCA), and the audit department of the Royal Army of Oman (RAO). A two-phase research methodology was adopted to develop and validate the T-O-E-I Framework and the Audit Quality Framework proposed in this study. The first phase consisted of qualitative in-depth semi-structured interviews with 12 internal auditors to verify the completeness and relevance of the T-O-E-I and Audit Quality Frameworks developed from a review of the literature. The second phase comprised a quantitative survey of 355 internal auditors. The data from this survey was descriptively and inferentially analysed. The T-O-E-I Framework was analysed using binary logistic regression and the Audit Quality Framework was analysed using regression analysis.

The development of two theoretical models, namely the T-O-E-I Framework and the Audit Quality Framework is the main contribution of this research. The T-O-E-I Framework advances our understanding of the factors influencing the internal auditor’s intention to adopt CAATs, whilst the Audit Quality Framework clarifies the factors that drive audit quality. The T-O-E-I Framework can assist internal audit organisations in identifying the barriers to, and facilitators of, CAAT adoption for internal auditors, and appropriate strategies to enhance technology adoption. Additionally, the Audit Quality Framework can determine which organisational and individual factors can drive perceptions of audit quality.
<table>
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<tr>
<th>Abbreviation</th>
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<tr>
<td>ASOSAI</td>
<td>Asian Organisation for Supreme Audit Institutions</td>
</tr>
<tr>
<td>AQ</td>
<td>Audit Quality</td>
</tr>
<tr>
<td>B2B</td>
<td>Business to Business</td>
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<tr>
<td>B2C</td>
<td>Business to Consumer</td>
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<tr>
<td>BCBS</td>
<td>Basel Committee on Banking Supervision</td>
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<tr>
<td>BI</td>
<td>Behavioural Intention</td>
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<td>CAATs</td>
<td>Computer Assisted Audit Techniques</td>
</tr>
<tr>
<td>CFA</td>
<td>Confirmatory Factor Analysis</td>
</tr>
<tr>
<td>CIRT</td>
<td>Center for Innovation in Research and Teaching</td>
</tr>
<tr>
<td>DIT</td>
<td>Dublin Institute of Technology</td>
</tr>
<tr>
<td>EDI</td>
<td>Electronic Data Interchange</td>
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<td>EE</td>
<td>Effort expectancy</td>
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<td>EFA</td>
<td>Exploratory Factor Analysis</td>
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<td>FA</td>
<td>Factor Analysis</td>
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<td>FC</td>
<td>Facilitating Conditions</td>
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<td>FRC</td>
<td>Financial Reporting Council</td>
</tr>
<tr>
<td>GAIN</td>
<td>Global Audit Information Network</td>
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<tr>
<td>GAS</td>
<td>Generalised Audit Software</td>
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<tr>
<td>GCC</td>
<td>Gulf Cooperation Council</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GIAS</td>
<td>Government Internal Audit Standards</td>
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<tr>
<td>IAASB</td>
<td>International Auditing and Assurance Standards Board</td>
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<tr>
<td>IFAC</td>
<td>International Federation of Accountants</td>
</tr>
<tr>
<td>IFRS</td>
<td>International Financial Reporting Standards</td>
</tr>
<tr>
<td>IIA</td>
<td>Institute of Internal Auditors</td>
</tr>
<tr>
<td>IIARF</td>
<td>Institute of Internal Auditors Research Foundation</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>IND1</td>
<td>Audit Independence on Budgets</td>
</tr>
<tr>
<td>IND2</td>
<td>Audit Independence on Planning</td>
</tr>
<tr>
<td>ISA</td>
<td>International Standard on Auditing</td>
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<td>ISACA</td>
<td>Information Systems Audit and Control Association</td>
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<tr>
<td>ISO</td>
<td>International Organisation for Standardisation</td>
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<tr>
<td>ITF</td>
<td>Integrated Test Facility</td>
</tr>
<tr>
<td>KMO</td>
<td>Kaiser-Meyer-Olkin</td>
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<tr>
<td>MENA</td>
<td>Middle East and North Africa</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<tr>
<td>PCA</td>
<td>Principal Component Analysis</td>
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<tr>
<td>PE</td>
<td>Performance Expectancy</td>
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<tr>
<td>PEFA</td>
<td>Public Expenditure and Financial Accountability</td>
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<td>PEU</td>
<td>Perceived Ease of Use</td>
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<tr>
<td>PFM</td>
<td>Public Finance Management</td>
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<td>PM</td>
<td>Pressure from Management</td>
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<td>POB</td>
<td>Public Oversight Board</td>
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<td>POS</td>
<td>Point Of Sale</td>
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<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>PU</td>
<td>Perceived Usefulness</td>
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<tr>
<td>RAO</td>
<td>Royal Army of Oman</td>
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<td>RCA</td>
<td>Royal Court of Affairs</td>
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<td>SAI</td>
<td>State Audit Institution</td>
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<td>SEC</td>
<td>Securities Exchange Commission</td>
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<tr>
<td>SI</td>
<td>Social Influence</td>
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<td>SIO</td>
<td>Social Influence Organisational</td>
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<tr>
<td>SIP</td>
<td>Social Influence Personal</td>
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<tr>
<td>SN</td>
<td>Subjective Norm</td>
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<tr>
<td>TAM</td>
<td>Technology Acceptance Model</td>
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<td>TB</td>
<td>Technological Benefits</td>
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<td>TBP</td>
<td>Time Budget Pressure</td>
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<tr>
<td>TMS1</td>
<td>Top Management Support for Skills Development</td>
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<td>TMS2</td>
<td>Top Management Support for Meeting Needs</td>
</tr>
<tr>
<td>TOE</td>
<td>Technology-Organisation-Environment</td>
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<tr>
<td>T-O-E-I</td>
<td>Technological-Organisational-Environmental-Individual</td>
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<tr>
<td>TP1</td>
<td>Time Pressure on Evidence</td>
</tr>
<tr>
<td>TP2</td>
<td>Time Pressure on Performance</td>
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<td>TR</td>
<td>Technological Readiness</td>
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<tr>
<td>TRA</td>
<td>Theory of Reasoned Action</td>
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<tr>
<td>TTF</td>
<td>Task-Technology Fit</td>
</tr>
<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
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<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>UTAUT</td>
<td>Unified Theory of Acceptance and Use of Technology</td>
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<tr>
<td>VIF</td>
<td>Variance Inflation Factor</td>
</tr>
<tr>
<td>VFM</td>
<td>Value for Money</td>
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<tr>
<td>WTO</td>
<td>World Trade Organisation</td>
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1. Research Overview

1.1 Introduction

This research aims to develop two models, the first of which is capable of predicting the internal auditor’s intention to adopt audit technologies, and second of which is to predict the factors that impact on the internal auditor’s perception of internal audit quality in the context of public sector auditing in Oman. The models proposed by this research are developed from existing research on technology adoption in general, as well as research on technology adoption specific to the internal audit context (Curtis & Payne, 2014; Dowling & Leech, 2014; Mahzan & Lymer, 2014). Given that Oman is only in the initial stages of utilising technology for auditing through the International Organisation for Supreme Audit Institutions (INTOSAI) working group for IT audit (Pysmenna, 2017), the internal audit context of government institutions in the Sultanate of Oman was considered appropriate for testing the models developed in this study.

In recent years, the State Audit Institution (SAI) in Oman has reinforced the requirement for high quality audit given the need for increased transparency and independence in public and private institutions (State Audit Institution, 2011). Adopting computer assisted audit techniques (CAATs) is identified as an effective strategy for improving the quality of the internal audit service (Pickett, 2010). Information technology (IT) based internal auditing using CAATs which includes generalised audit software (GAS,) can support the role of internal auditing within the organisation, as it strengthens internal controls (Pickett, 2010).

A two-phase research design with qualitative interviews (Phase 1), and a quantitative survey (Phase 2), was used to confirm the validity and reliability of the models developed. The findings from this study contribute towards the existing body of knowledge on the
factors which predict the adoption of audit technology by internal auditors, and the impact of audit technology adoption and related factors on their perception of internal audit quality. These models can in turn assist internal audit organisations in promoting audit technology adoption, thereby enhancing internal audit quality. This chapter explains the background to this research as well as its purpose and relevance. Thereafter, it discusses the significance of this research, the proposed models, and the structure of the dissertation.

1.2 Research Background

Information technology has become ingrained in all aspects of organisational activities (Héroux & Fortin, 2013). In the modern business environment which relies heavily on IT, technology based internal audits play a crucial role in reducing the perceived business risks arising from information technology usage (Chen, Smith, Cao, & Xia, 2014). Exploiting audit technology is recognised as instrumental in improving internal audit effectiveness (Lenz, Sarens, & D'Silva, 2014). The development of audit technology has a significant impact on every stage of the internal audit process, and internal auditors are required to understand and utilise audit technology to meet the objectives of the internal audit. This is because CAATs are effective software tools capable of performing detailed analyses of clients’ computer systems, including their configurations, logs, and vulnerabilities. This is essential to achieving the primary internal audit objective of independent appraisal of an entity’s controls, and evaluation of business risks and uncertainties (Cannon, 2016; Moeller, 2004; Pathak, 2005). Furthermore, adoption of CAATs is an effective method of enhancing the productivity of internal auditors since it allows increased coverage of system related transactions and events, enhanced testing, and more efficient and effective reporting (Coderre, 2009). Auditing standards all over the world such as the Auditing
Standard (AS) 2110 in the United States (US) namely, ‘Identifying and Assessing Risks of Material Misstatement’, recognise the importance of technology for internal auditing.

The internal audit function has become crucial, and its scope more diverse in the context of corporate financial scandals and failures in recent decades (Vinnari & Skærbaek, 2014). The internal audit function performs a wide range of tasks including risk assessments, internal control evaluations, governance, compliance and management consultations. Internal audit is an assurance function that evaluates the activities of the organisation and performs a consulting role to improve organisational operations. The primary aim of internal auditing is to support the organisation in achieving its organisational objectives by adding value to organisational operations (Usman, 2016). However, the evolution of the internal audit function to include additional consulting activities, coupled with the ever increasing volume of transactions to be audited has made contemporary internal auditing more challenging compared to traditional internal auditing (Gimpert & Barbour, 2006; Smidt, van der Nest, & Lubbe, 2014). For instance, the traditional internal audit function was typically confined to accounting and financial controls, whereas the focus of modern internal auditing for the information age has shifted to strategic issues within organisations (Héroux & Fortin, 2013).

Internal auditors are responsible for meeting the expectations of management, shareholders and the board of directors, in a resource constrained environment. In this context, internal auditors can employ available audit technology to effectively meet their audit requirements (Wongpinunwatana & Panchoo, 2014). Several studies have identified that internal auditors can significantly benefit from the use of IT for internal auditing, and that internal auditors are interested in the adoption of CAATs for internal auditing (Smidt et al., 2014).
A survey conducted by the Institute of Internal Auditors (IIA, 2003) in Ireland which examined CAAT usage by internal auditors, found that although more than 40% of internal auditors are willing to adopt CAATs for internal auditing, current usage is low. The main obstacles to actual usage of CAATs identified by that survey included a lack of suitable technology, technology risks such as fraud, and gaps in the skills required to use audit technology. While this is a somewhat dated survey, many of the issues it addresses are still relevant today. Accordingly, this research aims to provide a comprehensive list of the factors that influence technology adoption amongst internal auditors by using a technology adoption model specific to the internal audit context. The next section explains the problem statement for this research.

1.3 Problem Statement

Audit technology is recognised as an effective means of meeting the extraordinary demands placed on the internal audit function. This is because it provides structure to the internal audit function, and offers a means of documenting and managing the work flow, and completing audits with greater accuracy and efficiency (Gimpert & Barbour, 2006). Increasingly, internal auditors are recognising the importance of audit technology in performing internal audits, yet actual adoption levels of audit technology for internal auditing remains very low (Ahmi, Saidin, Abdullah, Ahmad, & Ismail, 2016). Computer assisted audit techniques are one form of audit technology used to enhance the efficiency and effectiveness of audits (Ahmi et al., 2016). CAATs are used for performing various audit procedures including tests of general controls, tests of details of transactions and balances, tests of application controls and analytical procedures, all of which increase the personal productivity of internal auditors and the internal audit function (Basu, 2006). Generalised audit software (GAS), test data, parallel simulation, integrated test facilities
and embedded audit modules are but a few types of CAATs widely used by internal audit departments (Ahmi et al., 2016). Since CAATs are the most widely used computer based techniques for internal auditing, the technology adoption model in this study predicts the internal auditor’s intention to adopt CAATs. The next section explains the need for an audit technology adoption model and an audit quality framework.

1.3.1 The need for an Audit Technology Adoption Model and Audit Quality Framework

Technology adoption amongst professional groups such as internal auditors is mainly examined using existing technology adoption models such as the technology adoption model (TAM) and the unified theory of acceptance and use of technology (UTAUT) (Kim, Mannino, & Nieschwietz, 2009). A major weakness in using existing models for technology adoption centres on their failure to consider specific factors relevant to an internal audit environment. Thus, there is a gap in the current literature for a model specific to technology adoption by internal auditors. In order to address this gap, this research develops an internal audit technology adoption model that can examine factors relevant to the internal auditor’s intention to adopt technology.

Internal audits performed using CAATs are regarded as higher quality audits (Ahmi et al., 2016). Several studies have identified a strong positive association between CAAT adoption and its impact on audit efficiency and quality (Smidt et al., 2014; Usman, 2016; Yan et al., 2011). However, there is no framework which evaluates the specific factors that influence internal audit quality, one of which may include CAAT adoption. The aim of the audit quality framework is to address this gap in the research through modelling a set of antecedents to internal audit quality.
1.4 Rationale for Focusing on Internal Audit of Public Institutions in Oman

Internal auditing allows government institutions to demonstrate greater transparency and to reduce instances of corruption (Pina, Torres, & Royo, 2010). The internal audit function motivates public institutions to enhance transparency and accountability (Aman, Al-Shbail, & Mohammed, 2013). Zhang and Lavena (2015) note that the public sector in Qatar and the United Arab Emirates (UAE) have the least amount of corruption in the GCC due to their effective internal audit and governance mechanisms which helps to ensure greater accountability and transparency. Accountability is essential in public institutions as personnel have an obligation and responsibility to act in the interests of the citizens and to justify their actions (Aman et al., 2013).

Accountability can be both internal and external in the case of public institutions (Aman et al., 2013). The need to enhance internal accountability is stronger in hierarchical public institutions such as those in Oman, because there is an emphasis on compliance with rules, laws and regulations of the government (Brinkerhoff, 2004). External accountability is also essential, as public organisations must report on their performance to external authorities including oversight bodies (Aman et al., 2013). An effective internal audit function within public sector organisations is crucial to enhancing their governance processes and accountability (Ahmi et al., 2016). Thus, internal auditing is imperative to ensure accountability of public institutions (Aman et al., 2013).

The State Audit Institution (SAI) of Oman is committed to ensuring that public sector organisations comply with financial laws and regulations, and is focused on improving the internal audit quality of public institutions. Internal audit is mandatory for public sector organisations in Oman as part of good governance to ensure transparency and
accountability in Oman (State Audit Institution, 2011). The International Organisation of Supreme Audit Institutions (INTOSAI) is an autonomous, independent and non-governmental organisation that operates with the objective of improving government auditing worldwide through promoting the development and transfer of knowledge and enhancing professional capacities of member state audit institutions (Pysmenna, 2017).

The executive regulations promulgated in Oman in 2009 have increased the standard of corporate governance demanded of the public institutions in Oman, thereby increasing the need for independent and high quality internal audits (Shankaraiah & Rao, 2002). However, the quality of the internal audit process in the Sultanate of Oman is regarded as questionable due to the methods involved in the internal audit process (Al-Essa, AlRubaie, Walker, & Salek, 2015). Control over internal audit in Oman has been tightened recently with the aim of combating corruption and addressing inefficiencies within government agencies (Ulrichsen, 2017). In the information age, governments worldwide are instilling greater effort to implement audit technologies to enhance the effectiveness of their internal audit functions (Ahmi et al., 2016).

The INTOSAI issued guidance in the form of GOV 9150, namely, Coordination and Cooperation between SAIs and Internal Auditors in the Public Sector, in which they emphasised the importance of internal auditors having a clearly defined role in promoting good governance in the public sector through enhancing the transparency and accountability in the usage of public resources (Pysmenna, 2017). Since Oman is significantly dependent on oil to provide funds for the national budget and development of the country, the economic crisis in Oman, coupled with the slump in oil prices increased the need for public sector organisations to act more responsibly (Ulrichsen, 2017).
With increasing demands being placed on the internal audit function, information technology is being recognised as beneficial to this end. Abu-Musa (2008) argues that information technology can increase the accuracy of transaction processing, promote the timely completion of internal audit tasks, and offer a competitive advantage to organisations through a reduction in human error, increased operational efficiencies and cost savings. However, the role of audit technology in enhancing the internal audit function in the public sector in Oman has received limited attention to date. Accordingly, it represents a suitable context within which to test the audit technology adoption intention model and audit quality framework developed in this study. The next section explains the models proposed in this research.

1.5 Proposed Models

The audit technology adoption intention model and the audit quality framework proposed in this research are examined in detail in this section.

1.5.1 Study 1: Model to Predict Audit Technology Adoption Intention

The model proposed in this study to predict audit technology adoption intention by internal auditors is based on existing models (Curtis & Payne, 2014) and studies (Lescevica, Ginters, & Mazza, 2013; Mahzan & Lymer, 2008; Williams, Rana, & Dwivedi, 2015) that have identified a number of factors that influence audit technology adoption by internal auditors. The evaluation of technology adoption models including the technology acceptance model (TAM), the technology-organisation-environment (TOE) framework and the unified theory of acceptance and use of technology (UTAUT) identify the main factors which influence the internal auditor’s intention to adopt technology. These are, technological factors, organisational factors, environmental factors and individual factors.
1.5.1.1 Technological Factors

The perceptions of internal auditors on the features and attributes of technology is covered under technological factors (Kim et al., 2009). Such features and attributes of audit technology may include data extraction, audit sampling, data mining, database querying, analytical tasks, manipulation and summarisation (Debreceny, Lee, Neo, & Toh, 2005). These features and attributes can be perceived as either risky or beneficial by internal auditors. Accordingly, technological factors can be further analysed by reference to technology benefits and technology risks.

Audit technology must be reliable and secure for internal auditors to implement it in practice (Ahmi et al., 2016). Studies on internal auditors’ actual adoption of audit technology have identified the significance of factors such as the security, safety and reliability of audit technology in predicting internal auditors’ actual adoption of information technology (Ahmi et al., 2016; Kim et al., 2009). The inability of technology based audit programmes in meeting the specific demands of internal auditing produces technological risks, and can affect the quality of the work performed (Wright & Capps, 2012). For example, Yeo et al., (2012) notes that the difficulty in identifying a suitable CAAT package to meet the needs of internal auditors prevents them from using CAATs as it can adversely affect the quality of their work. Hence, the intention of internal auditors to adopt technology is affected by technological risks.

Benefits of technology such as faster completion of work coupled with increased quality, have been identified to influence the internal auditor’s intention to adopt technology based internal auditing (Kim et al., 2009). CAATs are beneficial as they increase the efficiency and effectiveness of the internal audit function thereby allowing the completion of more
audit tasks in a short time (Radovanovic, Radojevic, Lucic, & Sarac, 2010). Considering the significance of technology benefits on the technology adoption intention of internal auditors, the proposed model on technology adoption intention includes technology benefits as a factor that influences the internal auditor’s intention to adopt CAATs.

1.5.1.2 Organisational Factors
Organisational factors play a crucial role in influencing the internal auditor’s perception of the benefits and risks associated with technology (Kim et al., 2009). Management support in the form of internal support and internal training, as well as pressure from management, has a significant influence on the internal auditor’s intention to adopt audit technology (Igbaria, Zinatelli, Cragg, & Cavaye, 1997).

1.5.1.3 Environmental Factors
Two environmental factors specific to the internal audit environment which influence the internal auditor’s intention to adopt technology are audit independence and audit time pressure. Internal auditor independence allows the internal auditor to make decisions that are impartial and objective (Kim et al., 2009). Auditor independence helps to increase public trust in the audit function. An independent internal auditor is perceived as fair and impartial, avoiding actions or words that would intentionally or unintentionally mislead others. Internal audit functions in many organisations work to a schedule, and so the intention to adopt technology may be affected by the time pressure experienced by internal auditors (Kim et al., 2009). Internal auditors having skills in the usage of audit based technologies may be more confident in using CAATs in a time constrained environment.
1.5.1.4 Individual Factors

Individual factors consist of technological readiness (TR) (Parasuraman, 2000), performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC) (Venkatesh, Morris, Davis, & Davis, 2003). These factors examine the internal auditor’s perception of the performance outcome, effort required and subjective norms associated with the adoption of IT, as well as the conditions necessary to effectively adopt audit technology (Phichitchaisopa & Naenna, 2013). A major issue affecting the technology adoption intention of internal auditors in many organisations relates to the complexity of the technology, and the difficulty in getting internal audit staff to use complex audit technologies (Gimpert & Barbour, 2006). Another key issue impacting the intention of internal auditors to adopt CAATs relates to a lack of adequate skills in performing technology based audit tasks. Figure 1.1 shows the model proposed in this study for predicting the internal auditor’s intention to adopt technology, namely the T-O-E-I Framework.
Figure 1.1 Proposed T-O-E-I Framework

Source: Author’s own
1.5.2 Study 2: Predicting Internal Auditor Perceptions of Internal Audit Quality

A systematic and disciplined internal audit process is necessary to achieve high audit quality, and to improve an organisation’s operations (Usman, 2016). Figure 1.2 shows the model proposed for internal audit quality. This model represents a theoretical framework capable of predicting the internal auditor’s perception of internal audit quality.

*Figure 1.2 Proposed Model – Audit Quality Framework*
Once the models were developed, the next step was to apply appropriate research methods to test the reliability and validity of them. The next section provides a brief overview of the methods used for this research.

1.6 Methodology

The internal auditors for this research study were recruited from three public institutions in Oman namely, the State Audit Institution (SAI), the Royal Court Affairs (RCA), and the Royal Army of Oman (RAO). The research was split across two phases. The first phase was the qualitative phase, whereby semi-structured interviews were conducted with internal auditors to examine their perceptions on the adoption of CAATs for internal auditing. The purpose of this phase was to examine and confirm the comprehensiveness of the proposed T-O-E-I Framework and Audit Quality Framework to ensure that no crucial variables influencing the internal auditor’s intention to adopt technology and their perception of audit quality were omitted from the model. A purposive sampling strategy was used to select the sample for the qualitative phase of the research. A total of 12 internal auditors from the SAI, RCA and RAO participated in the qualitative interview phase and the data was thematically coded and analysed.

The second and major phase of the research was the quantitative phase, whereby a survey was conducted to examine the proposed models developed for the research. The items used in the survey to examine each of the constructs in the models were developed from existing research. The quantitative questionnaire used included all the constructs necessary to examine both the Technological, Organisational, Environmental and Individual (T-O-E-I) Framework and Audit Quality (AQ) Framework. The respondents for the survey were
also selected using purposive sampling, and a total of 355 internal auditors from the SAI, RCA and RAO participated in the survey. The quantitative data from the respondents was analysed using the SPSS software package v23. Both descriptive and inferential statistical analysis was performed on the quantitative data collected. The descriptive statistical analysis facilitated an overview of the distribution of the data. The T-O-E-I Framework was analysed using binary logistic regression and factor analysis. The Audit Quality Framework was analysed using factor analysis and regression analysis.

1.7 Significance of Research
Audit technology is recognised as an effective solution in achieving operational efficiency in internal audit tasks (Champlain, 2003). The T-O-E-I Framework developed in this research can examine the extent to which an internal auditor is likely to adopt audit technology. To date, much of the research surrounding audit technology adoption by internal auditors employed technology adoption models such as UTAUT (Kim et al., 2009; Mahzan & Lymer, 2008) and TAM (Kim et al., 2009; Skantze, 2017), both of which are used in a wide range of fields, but are not specific to the internal audit context. Accordingly, these models fail to consider factors specific to internal auditors. In an effort to address this shortcoming, some studies have endeavoured to combine additional variables with existing technology adoption models to suit the internal audit context (Gimpert & Barbour, 2006; Kim et al., 2009). Accordingly, the theoretical significance of this research is the development of a new audit technology adoption model specific to the internal audit context. Currently, no model exists in the internal audit context for predicting the internal auditor’s intention to adopt technology. This research addresses this gap in the literature. The practical significance of the proposed T-O-E-I Framework is to predict the technology adoption intention of internal auditors, thereby enabling organisations to adopt
suitable strategies to enhance technology adoption. The main variables identified as negatively influencing the internal auditor’s intention to adopt technology can then be addressed using strategies that will increase the chance of adoption of audit technology by internal auditors, thus ensuring the overall effectiveness and efficiency of the internal audit function. A key reason for adopting audit technology is the perception that it leads to increased audit quality (Omonuk & Oni, 2015). Studies on the adoption of audit technology frequently argue that technology based internal auditing increases audit quality by reducing the errors typically associated with traditional manual audits (Rosli, Yeow, & Siew, 2012). Although existing research has identified the positive impact of audit technology on internal audit quality (Omonuk & Oni, 2015; Smidt et al., 2014), the factors which both influence technology adoption intention and increase audit quality have not received much attention. Accordingly, this study addresses a gap in existing research by developing a model that predicts internal audit quality using the factors that influence the internal auditor’s intention to adopt technology. The aim of the Audit Quality Framework is to predict internal audit quality by identifying the factors that influence the internal auditor’s perception of audit quality.

Thus, the two models developed in this research namely the T-O-E-I Framework and the Audit Quality Framework have both theoretical and practical significance. The theoretical significance of the T-O-E-I Framework is that it addresses a gap in the existing research by creating a theoretical framework capable of predicting the internal auditor’s intention to adopt technology. The practical significance of the T-O-E-I Framework is that it predicts the main factors that influence the internal auditor’s intention to adopt technology, thereby facilitating the identification of strategies necessary to enhance technology adoption. The theoretical significance of the Audit Quality Framework is that it addresses
a gap in the existing research by developing a model to predict the internal auditor’s perception of internal audit quality.

1.8 Structure of Dissertation

This research is organised into eight chapters per Figure 1.3. Chapter Two provides a detailed description of internal audit functions and internal audit quality. To differentiate internal audit and external audit a detailed description of external audit is also provided. Internal audit consists of a range of functions including the compliance, governance, management assurance and decision support, and risk assessment and fraud detection. The functions of the internal auditor are examined in Chapter Two.

Chapter Three of this thesis provides a detailed description of the development of the Technology-Organisational-Environmental-Individual (T-O-E-I) Framework and Audit Quality (AQ) Framework. The existing technology adoption models including the technology acceptance model (TAM), and the unified theory of acceptance and use of technology (UTAUT) that were used to develop the T-O-E-I Framework are reviewed in this chapter.

Chapter Four examines the institutional context of Oman, since this research was conducted in Oman. This chapter provides background information on Oman including its regulatory environment, audit institutions, and ethics in public administration. Chapter Five and Chapter Six present detail on the methodology used for the research. In particular, Chapter Five explains the first phase of the research methodology which involved a qualitative exploratory approach. In addition, the research objectives and hypotheses for this research are established. Chapter Six explains the second phase of the research where
by the T-O-E-I Framework and internal Audit Quality Framework are developed and tested. It also provides the descriptive statistical analysis with respect to the quantitative data.

Chapter Seven provides the main statistical analysis of the T-O-E-I Framework and the Audit Quality Framework. After a descriptive analysis, factor analysis was used to clearly identify the structure of the constructs in the two models. Binary logistic regression and regression analysis were used to test the T-O-E-I Framework and Audit Quality Framework respectively. Finally, Chapter Eight concludes this thesis with a summary of the main contributions of this work to the body of research on technology adoption intention and audit quality in the internal audit context. In addition, this chapter discusses the limitations of the study and offers suggestions for future research. The chapter concludes with a discussion of the implications of this research for the work of internal auditors in practice.
Figure 1.3 Structure of Thesis

Chapter 1:
Introduction to Research

Chapter 2:
Intimal Audit and Audit

Chapter 3:
Development of T-O-E-I

Chapter 4:
Institutional Context of

Chapter 5:
Methodology Phase
1. Exploratory Qualitative Research

Chapter 6:
Methodology phase2
Survey Research
Hypothesis and Instrument

Chapter 7:
Regression Theory and Logistic Regression

Chapter 8:
Conclusions

Source: Author’s own
2. Internal Audit and Audit Quality

2.1 Introduction

In recent decades the internal audit function has experienced a major transformation owing to advances in technology (Coetzee & Lubbe, 2014). Modern business organisations have computerised their accounting systems which necessitates the use of technology for internal audit purposes (Omonuk & Oni, 2015; Janvrin and Wood, 2016). The emergence of a technology based business environment has presented new challenges for auditing. This is because IT system failures or IT frauds that occur in computerised business environments can only be detected with IT based auditing skills (Omoteso, 2016). In the modern computerised business environment, the audit function cannot be effectively performed without proper IT tools and techniques (Omoteso, 2016). Thus, to improve the quality of auditing it has become necessary for auditors to utilise IT tools and techniques and to improve their associated IT skills (Janvrin and Wood, 2016; Omoteso, 2016). Technology based audit and the use of data analysis techniques has thus become critical for internal auditors exercising due professional care (Nzechukwu, 2017). Audit technology has been developed and promoted by auditors in terms of improving the standard of audit work (Salijeni, Samsonova-Taddei and Turley, 2018). Currently, technology based tools such as computer assisted audit techniques (CAATs) are increasingly available to perform internal audit functions (Smidt, van der Nest, & Lubbe, 2014).

CAATs play a crucial role in identifying and addressing organisational risks efficiently and comprehensively (Pal, 2012). In addition, the quality of audit reports is said to be positively influenced by the use of CAATs (Omonuk & Oni, 2015). The Institute of Internal Auditors (IIA) cites the importance of internal auditors having knowledge about
information technology risks, IT controls and technology based audit techniques to perform the assigned work (Nzechukwu, 2017). According to Moorthy et al., (2011) information technology helps to create a more controlled environment for delivering the internal audit process. Effective use of information technology is consequently crucial to pursuing internal audit goals (Pathak, 2005). Several studies have identified the need for a better IT auditing skillset among auditors for effective and efficient auditing in the future (Cram and Gallupe 2016; Farkas and Hirsch 2016; Haislip, Masli, Richardson, and Sanchez 2016).

Despite the rising significance of CAATs in the field of auditing, several gaps remain in the literature in relation to CAAT adoption for internal auditing. Firstly, a single theoretical framework for examining the intention of internal auditors to adopt CAATs does not exist. Existing frameworks associated with technology adoption such as the technology acceptance model (TAM), the unified theory of acceptance and use of technology (UTAUT), and theory of reasoned action (TRA) are not specific to the internal audit environment, and so exclude a number of important factors relevant to the internal audit setting. Secondly, a theoretical framework that focuses on the association between CAAT adoption intention and audit quality does not exist. Omonuk and Oni (2015) note that while CAAT adoption in larger firms leads to better audit quality, CAAT adoption in smaller firms does not lead to better quality. Nonetheless, there is limited evidence on the factors which underlie the relationship between the CAAT adoption intention and internal audit quality. To address these gaps in the literature, this research employed the Technology, Organisation, Environment and Individual (T-O-E-I) Framework to predict the internal auditor’s intention to adopt CAATs, and the Audit Quality (AQ) Framework to clarify the factors mediating the relationship between CAAT adoption intention and
audit quality. To set the scene for developing the T-O-E-I and Audit Quality Frameworks, this chapter provides an overview of auditing which consists of both internal and external auditing as well as an in depth review of existing literature on internal auditing, including its function and role in organisations, internal audit performance and effectiveness, audit strategy, audit planning, audit sampling, audit task complexity, ethical factors, internal audit reporting, internal auditor independence and audit quality.

2.2 Overview of Auditing

In the modern business environment, there is wide range of data produced by organisations on a real-time basis, and auditing plays a crucial role in providing assurance that the information produced is credible (Knechel and Salterio 2016). In the absence of an effective and efficient audit function, the information provided by organisations can be misleading or incomplete, thereby hampering effective decision making (Knechel and Salterio, 2016). For example, the lack of a transparent audit function that protected the interests of shareholders was one of the main reasons for the collapse of Enron (Adelopo, 2016). There are two key types of audit used by organisations, namely, external audit and internal audit. The objectives of external auditing and internal auditing are quite different. For example, the objective of the internal auditor is to increase the quality, efficiency and effectiveness of an organisation’s systems and operations (Dumitrescu and Bobitan, 2016). In contrast, the objective of external auditors is to provide an opinion on the truth and fairness of an entity’s financial statements based on an independent examination of the financial statements and underlying financial records of that entity (Siwawong & Phapruke, 2013). These two types of auditing are discussed next.
2.2.1 External Audit

The role of the external auditor, as defined by the International Auditing and Assurance Standards Board (IAASB), is to express an opinion on whether the financial statements are prepared in all material respects, in accordance with the applicable financial reporting framework (Dumitrescu and Bobitan, 2016). Thus, the primary function of external auditors is to provide assurance on the financial statements of an organisation (Zain, Zaman and Mohamed, 2015). They assess the extent to which the financial statements give a true and fair view of the entity’s financial performance and position (Palazuelos, Crespo and Corte, 2017). Accordingly, external auditors play a crucial role in assessing the credibility and legitimacy of the financial statements thereby ensuring that the organisation’s financial performance and financial position is represented accurately (Cenciarelli, Greco and Allegrini, 2018).

External audits are a legal requirement for many organisations and are performed by independent external auditors and auditing firms that are wholly separate from the organisations being audited. The audit criteria for external audits are driven by legislation and regulatory requirements and apply regulatory and industry standards (Gantz, 2013).

Several studies have emphasised the need for and benefits of close cooperation between the internal and external audit functions (Gantz, 2013; Pickett, 2010). The quality of the work undertaken by the internal audit function influences the external auditor’s ability to rely on that work when planning and conducting external audits. According to Mohamed Zain, Subramaniam and Yusoff (2012) external auditors assess the quality of the internal audit function to determine the extent to which the work performed by the internal auditors can be utilised in external audit work. External auditors evaluate the quality of the internal
audit function based on their objectivity, competence and the specific audit work performed by the internal auditors (Mohamed et al., 2012). External auditors also assess the quality of the internal control system to aid their understanding of the entity and to facilitate their assessment of the risk of material misstatement within the financial statements (Lee and Park 2016). A study conducted by Lawrence, Susan and Gary (2012) found that external audit delays and external audit fees may be reduced with internal audit assistance. A high quality internal audit function is beneficial for external auditors as they are expected to perform the most cost efficient audit to the highest standard of quality. The next section provides an overview of the internal audit function.

2.2.2 Internal Audit

The Institute of Internal Auditors Research Foundation (IIARF, 2013, p. 2) defines internal auditing as "an independent, objective assurance and consulting activity designed to add value and improve an organisation’s operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes". Petrsucu and Tienau (2014) define internal audit as an independent activity involving assessing and reviewing the economic activities of an entity on behalf of the entity's management. This includes activities such as examining the financial and accounting operations, improving risk management procedures and implementing company goals (Petrsucu and Tienau, 2014). An effective internal audit function facilitates the smooth running of an organisation's operations, thereby contributing to the achievement of the organisation's strategy and objectives (Asiedu and Deffor, 2017; Chambers and Rand, 2011).
The internal audit function is a key governance mechanism used to evaluate organisational risks, internal processes, procedures and controls (Zain, Zaman and Mohamed, 2015). Internal auditing may be performed by in-house employees of the organisation or it may be outsourced by the organisation (Gantz, 2013). It helps organisations accomplish their objectives by bringing a systematic disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes (Gantz, 2013). According to Munteanu and Zaharia (2014), evaluating internal control systems and organisational risks adds value to the organisation’s performance by improving management’s awareness of the processes and activities within the organisation.

The recent economic crisis expanded the scope of the internal audit function, and increased the pressure on chief audit executives to develop and maintain quality assurance programmes covering all aspects of internal audit activity (Bota-Avram, Popa, & Stefanescu, 2011). Accordingly, internal audit has become one of the key governance mechanisms for organisations, and typically encompasses risk management, control, assurance and compliance works (Mohamed et al., 2012). The knowledge base of internal auditors gained from engaging in all aspects of the business including internal controls and systems, as well as compliance and risk management, can be beneficial for organisations in improving their operations (Sarens & De Beelde, 2006). Increasing pressure on external auditors to provide high quality cost effective audits has increased the importance of superior internal audit departments (Zain et al., 2015). Although internal audit and external audit represent two distinct functions, significant synergies may be achieved through enhanced coordination and cooperation (Zain et al., 2015). The internal audit competency and quality depends on many attributes including training, professional certification and
audit experience (Mohamed et al., 2012). Increased experience and training increases the quality of the internal audit function (Senft, Gallegos and Davis, 2013).

### 2.2.2.1 Government Internal Audit

In recent years there has been increased focus on accountability, efficiency and effectiveness with respect to the services provided by government organisations (Van Gansberghe, 2005). Because government institutions tend to have less built-in performance and accountability measures compared to the private sector, the internal audit function has the capacity to deliver significant value for government institutions (Jarrar and Schiuma, 2007). Traditionally, government internal audit focused on activities such as reviewing financial controls. However, this is now changing with greater attention being directed towards assessing compliance with the organisational processes and evaluating the efficiency, effectiveness and economy with which public resources are allocated and managed (Van Gansberghe, 2005). According to Petrică (2008) government internal audit has four main objectives namely, assessment of the proper and effective use of public funds, development of powerful financial management, execution of administrative activities and communication of internal information to authorities and the public through impartial reports.

Government internal auditing aims to ensure the economy, efficiency and effectiveness of resource utilisation and adherence to financial, data processing, personnel and other administrative policies (Aseidu and Deffor, 2012). Government internal audit is a valuable asset to public sector organisations as it effectively supports the management of those institutions (van Rensburg and Coetzee, 2016). The internal audit function assists management in adding value and achieves its objectives by evaluating the effectiveness
and adequacy of risk management and control processes (van Rensburg and Coetzee, 2016). The main difference between the internal audit function in private organisations and government internal audit can be observed in the primary aim of each. For example, whilst internal auditing in private organisations assist them in fulfilling their primary objectives of profit making and increasing shareholder value, the purpose of government internal auditing is to achieve objectives such as providing public services and mitigating the risks specific to government institutions including fraud and corruption, improve performance and increase the confidence of citizens (van Rensburg and Coetzee, 2016).

Government internal audit plays a critical role in maintaining financial discipline, accountability and transparency in public sector organisations (Asiedu and Deffor, 2017). For this reason, government internal auditing is an essential governance function for an orderly government that fulfil the needs of its citizens (van Rensburg and Coetzee, 2016). The quality assurance from the internal audit in government institutions allows governments in developing nations to effectively prevent and detect fraud and embezzlement by public officials. A study conducted by Aseidu and Deffor (2012) found that implementation of an effective internal audit function in government departments is a useful way to combat corruption in public organisations. Government internal audit represents a value adding process which plays a crucial role in uncovering and preventing fraud within institutions. This is because the internal audit work allows the identification of risk factors that can lead to fraud and corruption. The next section emphasises how the mandate of the internal audit function differs to that of the external auditor.
2.3 Comparison of Internal and External Audit

The main difference between internal auditing and external auditing hinges on their purpose. While internal audits aim to enhance an organisation’s activities and operations; external audits aims to present an objective opinion on the truth and fairness of the financial statements. Although differences exist between the role and responsibilities of internal and external auditors, there is a degree of interaction and cooperation between them (Abbott, Daugherty, Parker and Peters, 2016; Arnold, 2009; Carey, Simnett and Tanewski, 2000; Dumitrescu and Bobitan, 2016; Munro and Stewart, 2011).

Differences between the internal and external audit function may be divided into three broad categories namely, approaches adopted (Mohamed et al., 2012), level of responsibility assumed (DeZoort and Lee, 1998; Cain, 2012) and scope of the work undertaken (Arnold, 2009). The approaches adopted in performing audit work can differ by auditor type because the internal auditor may have several aims to achieve by the work undertaken including an appraisal of the efficiency of the internal controls and the management information systems. However, the external auditor’s interest lies principally in assessing the truth and fairness of the financial statements (Mohamed et al., 2012). According to Cannon and Bedard (2016), the external auditors approach is based on the auditing framework as prescribed by the relevant country. With regard to the level of responsibility associated with each role, the internal auditor is answerable specifically to management, whereas the external auditor is responsible to the shareholders, and arguably, to an even wider public (Millichamp, 2002). Both are of course answerable to their consciences, and the ethical code of their professional accountancy bodies.
The scope of work undertaken by the internal audit function is broader than that of the external audit function, as internal auditors are responsible for the entire operation and functioning of an organisation, rather than financial statements and financial risks (Arnold, 2009). The scope of the internal audit function is based on its objective which is to support management in achieving maximum efficiency in its operations through a review of operations, processes and records at all levels of the organisation (Basu, 2006). Hence, internal auditors are relatively more knowledgeable about the business environment, company policies and procedures (Arnold, 2009). According to Mohamed et al., (2012) the scope of internal audit work is determined by management, whereas the scope of external auditing is established by statute.

Awareness of the positive impact of internal auditing has resulted in a steady increase in the number of organisations embracing internal auditing (Arnold, 2009). There are many international auditing standards such as International Standard on Auditing (ISA) 610 – ‘Using the Work of Internal Auditors’, which emphasise the potential contribution the internal auditing function can make to the external auditors (Mohamed et al., 2009). ISA 610 requires that external auditors obtain a thorough understanding of the work performed by internal auditors so as to assist them in planning their audit work, and assessing the degree of reliance they may place on work performed by the internal audit function (Millichamp, 2002). Many studies on the internal audit function have focused on the extent to which external auditors rely on internal auditors (Abbott, et al., 2016). The next section discusses the functions of the internal audit mechanism.
2.4 Functions of Internal Audit

Internal audit has become an activity of strategic importance in organisations especially in the context of the recent economic crisis (Alzeban and Gwillian, 2014; Bekiaris, Efthymiou and Koutoupis, 2013). Financial statement frauds, and the increasing number of earnings restatements by high profile corporates have eroded public confidence in the financial reporting process, corporate governance, and by association, the internal audit function (Ho & Hutchinson, 2010). The United Kingdom’s (UK) Corporate Governance Code, the Basel Committee on Banking Supervision (BCBS) and changes in the business environment, have all served to increase the responsibilities of internal auditors (Maria Alina & Elena Cerasela, 2014). Studies show the urgent need to reposition the internal audit function in the organisation to meet changing business needs (Caratas and Spatariu, 2014; Maria Alina & Elena Cerasela, 2014).

The traditional role of internal audit primarily focused on monitoring internal controls and financial compliance (Abdulaziz & David, 2014). This included activities such as examining and verifying the accuracy of accounting records and preparing reports on the internal control system of the organisation (Groff et al., 2016). According to Daniela and Attila (2013), the internal audit function in the past was mainly concerned with the analysis of accounting and financial issues, detection of key organisational risks, and the evaluation of internal controls. Internal auditing has frequently been re-defined over the years to accommodate the changing needs of organisations (Daniela & Attila, 2013). To this end, Alzeban and Gwillian (2014) emphasise the shift in understanding of the role of the internal auditor as focused primarily on monitoring internal controls and financial compliance, to a much broader consulting type function focused substantially on risk management, control, assurance, and compliance work (Mohamed et al., 2009). Thus, the internal audit
function has evolved from a traditional assurance activity to a hybrid of assurance and consulting activities (Munro and Stewart, 2011; Nagy and Cenker, 2002).

The modern business environment consists of many risks and corporate governance challenges, and in accordance with the changing business environment, the internal audit function has increased its focus on risk management (Groff, Di Pietra and Sitar, 2016). As noted, modern internal audit represents a combination of assurance and consulting activities, the main focus of which is on evaluating, enhancing and ensuring the effectiveness of governance, control and risk management processes (Munro and Stewart, 2011). Internal auditors perform an independent appraisal of the risk management function of organisations and offer recommendations for improvement (Munro and Stewart, 2011). According to Groff et al., (2016), the corporate risk management function of internal audit reduces accounting malpractice and opportunities for corporate fraud. Improving the control and risk management processes, reviewing the efficiency of operations and compliance with the corporate governance guidelines are just some of the many responsibilities associated with the internal audit function in organisations today (George-Silviu, 2014).

The internal audit function provides a comprehensive analysis of ongoing activities in an organisation using a variety of procedures and techniques based on the organisational structure and processes (George-Silviu, 2014). Caratas and Spatariu (2014) argue that internal audit functions which fail to adapt to the latest expectations of stakeholders do not contribute effectively to the prosperity and success of an organisation. According to Alzeban and Gwillian (2014), an effective internal audit function (1); reviews operations and programmes to examine the consistency of the results with organisational objectives
and goals, (2), reviews the reliability and accuracy of financial statements and reports, (3), reviews compliance with policies, plans, procedures and regulations, (4), reviews the economic, efficient and effective use of resources, (5), reviews the adequacy and effectiveness of the organisation's systems of internal control, internal accounting and operating controls, (6), reviews the means of safeguarding assets, (7), evaluates and improves the effectiveness of risk management systems, (8), makes recommendations for improving internal control systems when necessary, (9), reviews compliance with applicable external laws and regulations, (10), develops appropriate audit plans, and (11), follows up, to ensure appropriate corrective action has been taken.

Internal audit also examines the organisational structure, processes, and work methods, and their relationship with corporate governance guidelines (George-Silviu 2014). This function ensures that standards are met at all levels of the organisation (Botez, 2012). Botez (2012) views internal audit as an essential function in organisations because it increases transparency, adds value, and enables managers to better manage their activities and achieve company objectives. The key responsibilities of the modern internal audit mechanism can be organised into four key categories which focus on (1) compliance, (2) management assurance and decision support, (3) achievement of corporate objectives, and (4) risk assessment and fraud detection. These four responsibilities will be considered next.

2.4.1 Compliance Function

The internal audit function is responsible for evaluating the adequacy and effectiveness of operational and financial controls within an organisation and its compliance with laws and regulations (Graham, 2015) and corporate governance codes (Ho & Hutchinson, 2010). An independent audit serves shareholders who are not actively involved in the daily
running of the business, but whose interests need to be protected (Baldauf & Steckel, 2012). This is achieved through their preparation of internal audit reports which examine the effectiveness of the risk management systems, internal controls, governance mechanisms and compliance within the organisation. The internal audit function attests to an organisation's compliance with corporate governance codes and financial reporting standards which is in the interest of the stakeholders of the organisation (Botez, 2012).

2.4.2 Management Assurance and Decision Support

Management of organisations are increasingly aware of the importance of internal auditing to areas including management and control processes (George-Silviu, 2014). Internal audit not only provides added assurance concerning the effectiveness of internal control systems, it also offers assurance on the appropriateness of organisational activities and management decisions (George-Silviu, 2014). Internal audit activities such as the review of the accounting systems and internal controls, examination of the financial and operating systems, physical examination and verification and examination of the efficiency and effectiveness of internal controls, provide assurance with respect to organisational activities and support businesses in making appropriate organisational decisions (Basu, 2006). Caratas and Spatariu (2014) argue that internal auditors should support managers and external auditors in ensuring the reliability and integrity of financial reporting.

A study conducted by Nagy and Cenker (2002) on the director’s perceptions of the internal audit function revealed that internal auditing is perceived as being more focused on value adding activities such as assessing the effectiveness of internal controls, and recommending solutions to problems within internal controls. The recommendations and advice provided by internal auditors are generally implemented by management of the
organisation (Botez, 2012). Caratas and Spatariu (2014) argue that there is a strong link between an effective internal audit function and the prosperity of an organisation, because it helps to increase the value of the company and enables it to achieve its objectives by identifying and addressing problem areas within the organisation. However, Everett and Tremblay (2014) note that managers sometimes fear internal auditors on the basis that they mainly perform a policing type role, and offer little in the way of support for managers in improving their performance. Similarly, the study conducted by Lenz and Sarens (2012) found that the actual quality and work of the internal auditors is not consistent with the expectations of the management. Nagy and Cenker (2002) explain that the perceptions of managers and directors about the internal audit function varies depending on whether the internal audit function plays a more traditional assurance type role or a more value adding consulting type role.

2.4.3 Achievement of Corporate Objectives and Adding Value

A well organised system of internal control that complies with specified rules, regulations and ethical codes is necessary to achieve the objectives of the internal audit function (Munteanu & Zaharia, 2014). An internal audit function helps an organisation to accomplish its objectives by bringing a systematic and disciplined approach to evaluating and improving the effectiveness of risk management, control and governance processes. Munteanu and Zaharia (2014) maintain that contemporary organisations utilise the internal audit function as a control mechanism for management to achieve the objectives of the organisation. According to Daniela and Attila (2013), a key advantage of internal auditing pertains to the timely recommendations it provides to strengthen the effectiveness of an organisation’s processes.
Internal auditing is not only about monitoring and reviewing the internal controls and risk management systems within organisations, but also about adding value to organisational activities (Abbott, Parker, & Peters, 2012; George-Silviu, 2014). Daniela and Attila (2013) maintain that internal auditing is an independent consulting activity, designed to create value and to improve an organisation’s operations. The internal audit function is crucial for organisations in improving their performance, by helping them in achieving their objectives, as well as adding value through their activities, and by increasing the transparency of their operations (Botez, 2012). According to George-Silviu (2014), internal auditing adds value by providing assurance about the activities and decisions of organisations. A comprehensive evaluation of management processes, governance and control processes, and risk exposure of the organisation, allows internal auditors to offer solutions to yield efficiencies and overcome weaknesses within organisations (George-Silviu, 2014). However, a study conducted by Everett and Tremblay (2014) found that in most organisations the role performed by internal auditors is primarily focused on detecting irregularities and dysfunctional behaviours, with less importance ascribed to consulting with management and adding value to the organisation's performance through collaboration with management.

### 2.4.4 Risk Assessment and Fraud Detection

Due to the constantly evolving nature of the risks associated with the changing business environment, internal auditors are required to develop appropriate risk assessment tools and to continuously evaluate the reliability and usefulness of them (Fernández-Laviada, 2007; Naheem, 2016). According to Nagy and Cenker (2002) primary responsibilities of the evolved internal audit function are to examine risk management within the organisation and provide assurance that organisational risks are managed appropriately. Munteanu and
Zaharia (2014) note that the scope of work undertaken by the internal audit function has expanded to include the detection of key risks of the organisation, and a review of organisational processes and activities. The internal audit function provides the audit committee if available, or the board of directors, with information concerning risks identified and how they are being addressed (Millichamp, 2002). Although the responsibility to manage risk always resides with management, the internal auditor’s responsibility is to identify potential problem areas and recommend ways of improving risk management (Calder, 2008).

Internal auditors undertake a systematic evaluation of the organisation’s activities, internal controls and risk management systems based on internal auditing standards and other relevant practices, policies and procedures (Botez, 2012). According to Caratas and Spatariu (2014), evaluating and improving the effectiveness of risk management, control and governance processes are some of the main responsibilities of internal auditors in the current business environment. An effective internal audit means effective internal controls, and better risk management within the organisation. Effective risk management brings several benefits for the organisation (Baldauf & Steckel, 2012). For example, an audit can highlight financial concerns in advance, thereby serving as an early warning signal for the organisation.

An effective internal audit function plays a significant role in the prevention and detection of fraud (Petrscu and Tienau, 2014). Graham (2015) argues that internal auditors must take the primary and proactive responsibility to assess fraud risk and establish controls to prevent fraud risk. This is somewhat contrary to the historical understanding of audit which requires the external independent auditor to plan the external audit to detect material
misstatement caused by error and fraud. Since fraud detection measures by external auditors can result in unnecessary or redundant audit procedures and significant audit costs, entities now adopt strong anti-fraud controls and quality fraud assessments to detect and mitigate the fraud risks (Graham, 2015). Internal auditors highlight cases susceptible to the risk of fraud and advise management to take the action necessary to eliminate or reduce such risk.

2.5 Internal Audit Performance and Effectiveness

An effective internal audit function provides assurance and consultancy to firms to help them remain competitive, by overcoming the factors that lead to corporate failure such as low productivity, insufficient financing, poor financial management, and inadequate skills and competencies. According to Alzeban and Gwillian (2014), an effective internal audit function improves organisational performance and organisational productivity. Alzeban and Gwillian (2014) assert that factors such as the competence and independence of the internal audit department, the size of the internal audit department and management support for the internal audit department, are all crucial for maintaining internal audit effectiveness.

Competence and independence of the internal auditors are identified to improve the internal audit quality and effectiveness (Djati et al., 2016; Obeid, 2018; Usman, 2015). Abbott et al., (2016) tested the quality of the internal audit function as well as its ability to promote stronger financial reporting, and concluded that competence and independence are essential antecedents to an effective internal audit function. The presence of an independent internal audit department is acknowledged to improve internal audit
effectiveness of public sector organisations in Arab countries (Alzeban and Gwilliam, 2014).

The size of the internal audit department is also important since an adequately resourced audit department in terms of staff numbers, grades and experience is essential for an effective internal audit (Basu, 2006). George-Silviu (2014) notes that although internal auditors are typically employees of the organisation, the independence of internal auditors within the company is of the utmost importance for internal control effectiveness. Calder (2008) notes that the effectiveness of the internal audit function depends on the independence of the internal auditors. Accordingly, to enhance the independence of the internal auditors, their findings on risk management and internal control processes should ideally be reported directly to the audit committee as opposed to management. This approach reduces the level of interaction between the internal auditors and management, thereby strengthening the independence of internal auditors (Calder, 2008). Many Middle Eastern countries demonstrate comparable cultural dimensions including an Islamic ideology, strong family and friendship linkages, and religious obligations, all of which make the internal audit function in these countries quite similar. According to Alzeban and Gwillian (2014), the internal audit function in Middle Eastern counties must be monitored and controlled with proper mechanisms to remove personal interests in financial dealings and ensure their effectiveness. Alzeban and Gwilliam (2014) examined whether the underlying cultural and economic factors at play in Saudi Arabia influence internal audit effectiveness. They found that management support is a crucial factor in ensuring internal audit effectiveness in Arab countries, as this increases access to resources for effective internal audit functioning. For example, management support results in the allocation of adequate resources, and recruitment of trained and experienced staff which
promotes internal audit effectiveness (Alzeban and Gwilliam, 2014). Planning the audit is a critical stage of the audit process and crucial to its effectiveness. The audit plan is more detailed than the audit strategy as it includes the extent, timing and nature of the audit procedures (Delaney and Whittington, 2009).

2.6 Audit Strategy
The audit strategy establishes the scope, timing, and direction of the audit, and therefore provides the framework for the more detailed audit plan (Budescu, Peecher, & Solomon, 2012). The purpose of the audit strategy is to determine the characteristics and priorities of the audit, and to ascertain the financial reporting framework to be used. In addition, the audit strategy identifies industry-specific reporting requirements and locations of the entity with a view to developing the most effective means of achieving the audit objectives (Abdullatif, 2013). An audit strategy helps to establish the reporting objectives, and the nature of the communication required, along with deadlines for interim and final reporting (Siwawong & Phapruke, 2013). Key dates for reporting to those charged with governance are specified in the audit strategy (Siwawong & Phapruke, 2013).

There are two key approaches available when deciding on an audit strategy namely, the substantive approach and the business risk-based auditing approach (Abdullatif, 2013). The substantive approach is usually adopted for the audit of smaller organisations where internal control systems are weak, and there is a small number of staff (Budescu et al., 2012). For example, a small family owned business requiring an audit might have a simple proprietary computer-based bookkeeping system and a part-time bookkeeper responsible for all accounting related work. In contrast, business risk-based auditing is typically used for larger organisations or in firms possessing excellent internal control systems (Budescu
et al., 2012). In this instance, the auditors carry out a limited amount of testing of transactions and balances, and instead concentrate their efforts on analysing the business risks facing the organisation. The next section examines audit planning in more detail.

2.7 Audit Planning

Audit planning is crucial as it helps to reduce audit risk to an acceptable level (Delaney and Whittington, 2009). The audit plan specifies the nature, timing, and extent of audit procedures (Baldauf & Steckel, 2012). Audit planning is important because it sets the scene for the entire audit project, providing guidance as to who performs various tasks and when. The audit plan assists the auditor with the direction and control of audit work to ensure that attention is devoted to critical aspects of the work. This plan also facilitates the timely identification of areas that may pose a high risk of material misstatement (Siwawong & Phapruke, 2013). Additionally, the audit plan helps to ensure that audit resources are deployed appropriately in terms of audit staff numbers and expertise to meet the needs of the audit. Bentley, Omer, and Sharp (2013) maintain that audit planning facilitates the subsequent review process, and serves as a performance measure for audit activity as the audit progresses. The auditor must develop the audit plan for the duration of the audit in order to reduce audit risk to an acceptably low level (Punchaporn, Phapruke, & Sutana, 2013; Sakchai & Phapruke, 2011). Irrespective of the amount or quality of audit work undertaken no audit is risk-free (Abdullatif, 2013), as this would require the auditor to examine every single transaction in the financial statements (Sakchai & Phapruke, 2011). The auditors must acquire knowledge of the client by identifying and assessing the risk of material misstatement through understanding the entity and its environment (Sakchai & Phapruke, 2011). Fundamentally, the audit plan requires the auditor to carry out a form of risk assessment so as to determine the risk of material misstatement, arising
either at the level of the financial statements as a whole, or within any component of them (Abdullatif, 2013). Accordingly, a balance must be achieved between the amount of risk considered acceptable, and the amount of additional audit work considered necessary to reduce audit risk. Planning the audit time allocation is important for several reasons. It is necessary to understand the audit task's requirements and timescale to ensure that the use of resources is controlled effectively and that areas of risk are adequately addressed (Etheridge, 2012; Suhayati, 2012).

According to Etheridge (2012), proper planning provides assurance as to the adequacy of available audit resources at various times during the audit process. If insufficient time is available for review of all the required systems, processes, or risks within a cycle, additional resources may have to be allocated to the audit assignment and these must be sourced in advance (Etheridge, 2012; Suhayati, 2012). An audit may be carried out on entities large and small, and new and well established. The International Standards on Auditing (ISAs) do not distinguish between large and small organisations except in very particular circumstances. Thus, an audit must be carried out to the same standard regardless of the size of the organisation (Abdullatif, 2013). Auditors must do this by obtaining a thorough understanding of their client’s business, its management, the environment in which the business operates, and the quality of its internal financial reporting procedures (Abdullatif, 2013). According to ISA 315 – ‘Identifying and Assessing the Risks of Material Misstatement through Understanding the Entity and its Environment’, auditors are required to obtain sufficient knowledge of the client to enable them to identify and understand the events, transactions and practices that may have a significant effect on their financial statements and in auditing those financial statements.
The following section discusses how the auditor selects samples of transactions and balances for audit testing.

2.8 Audit Sampling

Audit sampling is the application of audit procedures to less than 100 per cent of the items in a class of transactions or account balance such that all sampling units have an equal chance of selection (Burtescu & Grigore, 2011; Oana & Tatiana, 2013). This approach assists in forming a conclusion in a timely fashion concerning the entire population from which the sample is drawn (Oana & Tatiana, 2013). The objective of sampling is to enable the auditor to form a meaningful conclusion given the size of the organisation and the number of transactions processed. In doing so, the auditor may encounter sampling risk and or non-sampling risk (Burtescu & Grigore, 2011). Sampling risk is the risk that the auditor’s conclusion based on the sample would be different from the conclusion that would have been reached if the whole population had been subjected to audit testing (Burtescu & Grigore, 2011). Non-sampling risk is the risk that the auditor reaches an incorrect conclusion for reasons not associated with the use of sampling. For instance, factors such as a lack of experience or human error may cause the auditor to arrive at an incorrect conclusion. Sometimes it is preferable not to apply a sampling method at all. This would include cases such as those involving fraud investigations, or where there is a very small population to begin with (Finley, 1989). Two factors should be decided upon before sampling is employed namely, the approach or selection method to be used, and the sample size deemed appropriate (Finley, 1989). The sample size must be sufficiently large to conduct a test, but not so large that the audit team are wasting time carrying out tests which do not add to the validity of the evidence already gathered. Approaches available include statistical and non-statistical sampling.
2.8.1 Statistical Sampling

Statistical sampling is the selection and statistical evaluation of the results obtained from a sample of a group of items to determine the characteristics of the entire group (Wilburn, 1984). Key statistical sampling approaches include random and interval sampling. Random sampling is often preferred in practice because of the assumption that the sample selected using the random sampling technique is representative of the population (Gemayel, Stasny, Tackett, & Wolfe, 2012). A key requirement of random sampling is that each item has an equal chance of selection (Gemayel et al., 2012). An alternative approach known as the interval sampling approach involves the auditor selecting a starting point from the population at random and then setting a fixed interval between selections thereafter (Gemayel et al., 2012). Since this approach does not cover the whole population, it can suffer from the same limitation as random sampling if errors are spread randomly throughout the population (Finley, 1989). Similarly, if the errors are not spread randomly, interval sampling may not prove useful in what is a representative sample. A key advantage of statistical sampling however, is that it protects the auditor against charges of bias or favouritism (Burtescu & Grigore, 2011). Although deciding which approach to take may be a matter of judgment, the auditor will always strive to demonstrate scientific rigour when using sampling (Burtescu & Grigore, 2011).

2.8.2 Non-statistical Sampling

Non-statistical sampling, also termed judgmental sampling, is a non-probability based sampling technique which involves selecting a sample of an appropriate size based on the auditor’s judgment of what is desirable (Burtescu & Grigore, 2011). Examples of this type of sampling include block and cluster sampling. Block sampling makes no attempt to select a representative sample, but instead entails the selection of a block of transactions
to test for the existence of specified criteria. The auditors may use this method when testing a system. An example of block selection might entail the examination of all remittances from customers for only one month, or selecting remittances based on numbers. For example, the auditor may only examine remittances numbered 250-300 (Gemayel et al., 2012).

The cluster sampling approach involves identifying clusters of records from the population as opposed to individual items (Burtescu & Grigore, 2011). With cluster sampling, the whole population of data is split into pre-existing segments termed clusters. Typically, these clusters are geographic. Thereafter, the clusters are randomly chosen, and each member of every chosen cluster is included in the sample. Auditors may use this method when testing a system. For example, in the case of purchase orders, a sample size of 150 items may be divided into clusters of 10 or 15. Then, three or four clusters will be randomly selected and all the items in these clusters will be tested. The objective of all sampling approaches is to draw a conclusion about a larger volume of data namely, the population, based on an examination of the sample taken from that population (Burtescu & Grigore, 2011). However, regardless of the approach adopted auditors cannot give unbiased opinions unless they are independent of all the parties involved (Burtescu & Grigore, 2011). This can be problematic given that internal auditors depend on their employers for their income (Burtescu & Grigore, 2011). Nonetheless, independence is paramount. The next section explains the task complexity experienced by internal auditors.

2.9 Audit Task Complexity

Tasks are defined as activities conducted by people that allow them to move forward in work and life (Chung & Monroe, 2001). Task complexity, which is of great interest in
many fields, particularly fields involving decision making, has been found to be an important factor that influences and predicts human performance (Sanusi, Iskandar, & Poon, 2007). It is generally believed that human performance depends on the interaction between task characteristics including the task’s complexity and its urgency (Chung & Monroe, 2001). According to Chung & Monroe (2001), despite technological innovations which make it easier to perform many tasks, these same innovations have in some cases made our lives and other tasks more complex than ever. For example, auditors store significant amounts of data in electronic databases, but sometimes the data may get lost or corrupted due to a system crash. Hence, auditors are required to maintain a continuous backup of their work which ultimately adds to their work load.

Task complexity has three dimensions namely, the complexity of the component, the complexity of coordination, and complexity of the dynamic (Wood, 2012). Complexity of the component is when the number of business and informational cues needed to accomplish a particular task increases. Coordinative complexity arises when the pattern of relationships among informational cues, actions, and products is more intricate. Dynamic complexity refers to changes to the component complexity and coordinative complexity over time (Haerem, Pentland and Miller, 2015). Tasks include complex multifaceted structures that place greater demands on the behavioural and media processing performance of internal auditors (Chen, Casper, Wekortina, 2001). Therefore, significant resources are needed such as effort and continuous behaviours to accomplish complex tasks. The complexity of the audit task varies according to the nature of the task with regard to factors such as the type of account balance, its size, and the number of informational cues in the data set (Chung & Monroe, 2011). The next section explains risk assessment in internal audit.
2.9.1 Audit Risk Assessment

Risk can be defined as the possibility of encountering danger and as a result, suffering damage, harm, or loss (Roberts, 1975). This is a very broad definition of risk, because risks that threaten an organisation come in all shapes and sizes. According to the International Federation of Accountants (IFAC), risk control and fraud are management’s responsibility, and the establishment of a system of risk management is critical to an organisation’s success (Abdullatif, 2013). The auditor must consider at an early stage the likely impact of risks for the audit of the financial statements (Abdullatif & Al-Khadash, 2010). The audit partner must provide a balanced evaluation of significant risks identified.

He or she must also establish the effectiveness of the client’s internal control system for measuring, detecting, correcting and preventing these risks from occurring (Roberts, 1975). ISA 200 – ‘Overall Objectives of the Independent Auditor and the Conduct of an Audit in Accordance with International Standards on Auditing’, requires the auditor to obtain reasonable assurance of whether the financial statements as a whole are free from material misstatement whether owing to fraud or error (Abdullatif & Al-Khadash, 2010). This assurance is gained by the auditor through obtaining sufficient appropriate audit evidence to reduce audit risk to an acceptably low level.

The primary objectives of ISA 200 are for auditors to identify and assess the risk of material misstatement at the financial statement level and at the assertion level for classes of transactions, account balances and disclosures (Abdullatif & Al-Khadash, 2010). Risk of material misstatement at the assertion level refers to risk of material misstatement of individual transactions, account balances and disclosures, presented by management as correct. The risk of material misstatement at the assertion level consists of inherent risk,
control risk and detection risk (Abdullatif & Al-Khadash, 2010). Inherent risk is the susceptibility of an assertion to misstatement that could be material, assuming that there are no related controls (Beasley and Carcello, 2008). Control risk is the risk that a misstatement that could occur in an assertion, and that could be material will not be prevented on a timely basis by the entities internal controls (Delaney and Whittington, 2010). Detection risk can occur when the auditor fails to detect a material misstatement. In this case, the internal controls are working properly, but the misstatement is overlooked by the auditor due to factors such as human error, poor supervision, or negligence (Abdullatif & Al-Khadash, 2010). The next section explains the time pressure resulting from the time budget in internal auditing.

2.9.2 Audit Time Pressure

Auditors often encounter pressure from inflexible time budgets, an issue that at least partly originates from the tendering process for audit contracts (McDaniel, 1990). The time budget for internal auditing is set at the planning phase of the audit and is usually calculated by determining the time required to conduct the audit work from the commencement of the assignment to the issue of the final report. There is a potential trade-off between controlling costs and achieving high-quality audits (McDaniel, 1990; Svanberg & Öhman, 2013). This trade-off is heightened by the immense weight placed by audit firms on their staff to strictly adhere to time budgets as a measure of their efficiency (McDaniel, 1990; Svanberg & Öhman, 2013). As a result of this, unpaid overtime to counterbalance the effect of unattained time budgets is an informal cultural norm at play in many external auditing firms (McDaniel, 1990; Svanberg & Öhman, 2013).
The time pressure for internal audits not only results from the time constraints set by management but also stems from time pressure within the job itself (Kagermann, Kinney, Küting and Weber, 2007). For example, when performing an audit directed specifically at uncovering suspected internal fraud, time is of the essence. This is because associated risks may crystallise immediately, increasing the need to act fast to obtain sufficient appropriate audit evidence within the shortest possible timeframe (Kagermann et al, 2007). Time budget pressure (TBP) in competitive environments such as in audit firms has been suggested as a key cause for the deterioration in audit quality (McDaniel, 1990; Svanberg & Öhman, 2013). From the audit firm’s perspective, dysfunctional auditor behaviour that results from many of the parameters that collectively form the quality-cost conflict such as time pressure, are externally determined and cannot be significantly influenced by a single audit firm (McDaniel, 1990; Svanberg & Öhman, 2013). According to this perspective, audit time pressure is a result of competition, whilst audit quality requirements are dictated by the audit profession (Alvesson & Kärreman, 2004). Proponents of this theory also maintain that dysfunctional auditor behaviour results from factors under management control such as ineffective leadership (Alvesson & Kärreman, 2004). Audit time budgets motivate those involved in completing the audit by providing pre-determined targets for both senior and junior staff (Favere-Marchesi, 2006). Measuring productivity helps the degree of achievement and is responsible for the effective use of resources.

With increasing reliance on supply and service chains across different business organisations, sectors, and countries, internal audit work now not only focuses on auditing internal processes, but also, external ones (Kagermann, Kinney, Küting and Weber, 2007). Where an entity has a number of branches in different locations, this may increase problems for the auditor by creating further time pressure owing to the need to visit these
locations to perform audit work. However, typically in such cases some of the branches are visited as samples, or all of the branches are visited in rotation (Favere-Marchesi, 2006; McDaniel, 1990). The timing of the audit work also depends on many factors. For example, in some larger audits with highly computerised records, audit evidence is sometimes available only on a temporary basis. In the majority of cases, one extended visit termed an interim audit, may be performed by the auditor in order to carry out audit work during the year (McDaniel, 1990). Normally, an interim audit occurs during the financial year and very often lasts for approximately three months such as from September to November inclusive. The interim audit includes determining the client’s system of accounting and internal control, as well as reviewing and identifying changes to their system since the previous year (Favere-Marchesi, 2006; McDaniel, 1990). Another major factor that influences auditors in executing their responsibility is ethical considerations (Fountain, 2016). The next section examines the ethical considerations for internal auditors.

2.10 Ethical Factors

Professional ethics is central to an effective audit function (Helliar & Bebbington, 2004). Every professional accountancy body establishes ethical standards which include basic principles and essential behaviours that auditors must demonstrate. For example, in 2004, the Financial Reporting Council (FRC) established a code of professional ethics to guide the conduct of auditors in the UK and Ireland (FRC, 2017). These ethical standards require auditors to demonstrate integrity, objectivity, discretion and confidentiality, fairness, due skill, care, and diligence, and independence in the audit of financial statements (Kagermann, Kinney and Kuting, 2007). In addition, auditors are required to follow the ethical standards established by the professional accountancy bodies they are affiliated
with. Any auditor who compromises relevant ethical codes undermines the quality of auditing (Scofield, Phillips, & Bailey, 2004). Poor ethical decisions not only negatively impact the outcome of the internal audit exercise, but also the personal reputations of those concerned (Fountain, 2016). Internal auditors play a central role in building a strong ethical culture in their organisations owing to their role in evaluating ethical standards internally (Schartmann, 2007). Thus, it is crucial for the internal auditor to behave ethically thereby providing assurance to the board and shareholders concerning the integrity of the organisation’s internal control system (Schartmann, 2007). The quality of internal audit services therefore depends on the objectivity and consistency of internal auditors.

Poor ethical conduct on the part of the auditors, including a lack of integrity, objectivity and transparency, were identified as a key reasons for the collapse of Enron (Bratton, 2001). Internal auditors have exposure to sensitive areas of the business and therefore have significant ethical responsibilities (Moeller, 2009). Sweeney, Arnold and Pierce (2010) identified several factors that influence the ethical decision making of auditors, including cost and time constraints, and the perceived ethical culture of the firm. Cost and time constraints affect the ethical decision making of auditors as these variables impact audit quality. Pierce and Sweeney (2006) found that cost and time constraints have the capacity to cause auditors to engage in audit quality threatening behaviour and poor ethical decision making. The perceived ethical culture of the firm has a significant influence on auditor ethics (Sweeney et al., 2010). Sweeney et al., (2010) found that the auditor’s perception of an unethical culture within the audit organisation can influence the auditor’s decision to engage in these behaviours. High standards of accounting are necessary to ensure good corporate governance and ethical practices in organisations (Shankaraiah & Rao, 2002). The rapid industrial growth rate and the increasing size of Omani public and private firms
have increased the expectations of various stakeholders, which can only be satisfied through good corporate governance (Shankaraiah & Rao, 2002). Recognition of the benefits of good corporate governance, and increasing stakeholder demands, have resulted in Omani firms committing to improving their ethical and corporate governance practices (Shankaraiah & Rao, 2002). The next section examines the internal audit reporting process.

2.11 Internal Audit Reporting

Owing to advances in the business environment, internal auditing has become more focused on corporate risk management, fraud detection, and resolving corporate governance problems (Groff et al., 2016). According to Daniela and Attila (2013), the internal audit process involves collecting, analysing and evaluating information to obtain reasonable assurance in order to perform actions such as issuing recommendations or determining deviations from established criteria, and evaluating consistencies between different types of evidence collected. An internal audit report details the purpose, scope, findings and recommendations of the audit work undertaken (Vallabhaneni, 2013), and internal auditors have the authority to report directly to the board of directors, the statutory external auditor, and the audit committee of the organisation, if one exists (Basu, 2006; Calder, 2008). The main content of the internal audit report is determined by the internal audit objectives (Switzer, 2007). A formal internal audit report outlines the main concerns and recommendations of the internal auditors (Moeller, 2005). The information and evidence gathered from the internal audit exercise are converted into findings and are reported as concerns and recommendations in the audit report (Switzer, 2007). The next section explains the importance of independence for internal auditors.
2.12 Internal Auditor Independence

Auditor independence is an essential component of the internal audit (Basu, 2006). Auditor independence embodies an absence of interests that create an unacceptable level of risk of material bias with respect to the credibility of the financial statements (Nur Barizah Abu, Abdul Rahim Abdul, & Hafiz Majdi Abdul, 2005). According to the International Federation of Accountant’s (IFAC) Code of Ethics for Professional Accountants, independence encapsulates both independence of mind and independence in appearance (Vandervelde, Brazel, Jones, & Walker, 2012). Independence of mind is very difficult to judge but there are certain salient points that should be taken into account in its assessment (Bennett & Hatfield, 2013). The internal auditor relies on their employer for their livelihood and this must therefore be a limiting factor when considering how much reliance one can place on the auditor's opinion. Independence of mind means that the auditor should not act based on his or her personal likes and dislikes while certifying accounting statements (Bennett & Hatfield, 2013). Independence requires that the auditor avoid any position or relationship with the client involving a loss of independence.

Internal auditor independence has become more important in recent years in light of the need for stronger corporate governance and internal control. With the rising significance of the internal audit function, independence of internal auditors has become the priority of the Institute of Internal Auditors (IIA) (Moeller, 2004). Basu (2006) argues that independence is more difficult to achieve by internal auditor as they are typically employees of the organisation that they provide audit services to. There is a requirement for independence and objectivity in all work conducted by auditors. It is of utmost importance to the business world in general and to the auditing profession in particular that
audit quality is upheld by practitioners. Audit quality will now be considered in more detail in the next section.

2.13 Audit Quality

Internal auditors must be able to perform their role with relevant skills, techniques and knowledge to achieve the desired level of internal audit quality (Abbott et al., 2016). The quality of work performed by an internal auditor is influenced by several factors including the size of the company, the objectives of the audit, the applicable auditing standards (Mahzan & Lymer, 2014), and the relevant industry (Bedard, Johnstone, & Smith, 2010). The size of a business can influence internal audit quality since larger companies have more resources to staff a larger internal audit department. Hermanson, Smith, and Nathaniel (2012), and Abbott et al., (2016), identified a positive relationship between the size of a business and internal control strength.

Audit quality control encompasses a systematic examination of the quality system in place in the audit firm (Yahn-Shir, Joseph, Mei-Ting, & Ping-Sen, 2013). All the components of audit including audit independence, audit sampling, task complexity and time pressure ultimately determine audit quality (Hajiha and Khodamoradi, 2016). To ensure the effectiveness of the quality management system of an audit firm, management in audit firms must first discharge their overriding responsibility to establish and maintain a system for dealing with audit quality policy (Jong-Hag, Kim, Jeong-Bon, & Yoonseok, 2010). Audit quality policy consists of general principles to realise the principle of continuous improvement (Yuniarti, 2011). Audit quality is an important part of any organisation's quality management system and is a key element in the International Organisation for
Standardisation’s (ISO) quality system standard ISO 9001 - ‘Quality Management Systems’.

2.14 Conclusion

This chapter distinguished between internal and external auditing. It discussed the key functions typically undertaken by internal auditors, as well as the factors driving internal audit quality and effectiveness. Internal auditing has become an integral part of modern business operations. All aspects of business operations are the subject of internal auditing to ensure the smooth running of the business and to achieve the objectives and goals of the organisation. Some of the main functions of the internal auditor include monitoring internal controls and financial compliance, risk management, and management assurance and decision support. Thus, the modern internal auditing function is a hybrid of assurance and consulting activities. Internal auditing must create value for the organisation in order to be effective. This chapter examined key aspects of internal auditing which play a crucial role in the effectiveness of internal auditing. These include audit planning, determining the overall audit strategy and audit sampling. Audit risk assessment and audit time pressure are major determinants of audit task complexity. However, regardless of the level of complexity of the audit task it is the responsibility of the internal auditors to ensure that audit quality is upheld. Internal audit quality is crucial for the effective functioning of the business. The next chapter examines technology adoption models to evaluate the role of technology adoption on internal audit quality.
3. The Development of the T-O-E-I Framework

3.1 Introduction

The internal audit function has evolved into what is considered one of the key governance mechanisms in organisations today (Coetzee & Lubbe, 2014; Rubino & Vitolla, 2014, Soh and Martiov-Bennie, 2015), typically encompassing activities including risk management, control, assurance, and compliance work (Mohamed, Mat Zain, Subramaniam, & Wan Yusoff, 2012). An effective internal audit function allows the smooth running of an organisation's operations and contributes to the achievement of the organisation's strategy and objectives (Bota-Avram, Popa, & Stefanescu, 2011). The recent global economic crisis served to expand the scope of the internal audit function and increased the pressure on chief audit executives to develop and maintain a quality assurance programme covering all aspects of internal audit activity (Mazza, Azzali, & Fornaciari, 2014).

In the modern business environment auditors must recognise the value of emerging technologies (Moorthy, Mohamed, Gopalan, & San, 2011). The increasing frequency and complexity of technology used in companies have consequently increased the importance of technology based internal auditing (Dowling & Leech, 2014; Janvrin and Wood, 2016; Mazza et al., 2014). Effective use of IT is perceived as necessary by internal audit leaders to pursue internal audit goals. Several studies have identified the importance of internal auditors acquiring new IT skills and abilities that enable the auditors to provide assurance on technologies (Janvrin and Wood, 2016; Omoteso, 2016). Moorthy et al., (2011) argue that IT based internal auditing can increase the transparency and governance of the organisation, enhance decision-making processes within the organisation through means of improved data, reduce fraud and abuse, and enhance internal audit efficiency. According to Dowling and Leech (2014), IT helps to create a more controlled environment.
for delivering the internal audit activity. This is because IT plays a crucial role in identifying and addressing organisational risks (Moorthy et al., 2011).

The Institute of Internal Auditors’ (IIA) standards state that the internal auditors other than those who have primary responsibility for information technology auditing do not necessarily require technology based auditing expertise. However, the IIA recommend that internal auditors should consider the use of technology based audit tools such as computer assisted audit techniques (CAATs) including generalised audit software (GAS) in exercising due professional care. This suggests that technology adoption by internal auditors is predominantly at their own discretion or at the discretion of their respective organisations. In the current context of growing businesses and ever growing demands of stakeholders, the effectiveness of the internal audit function depends on the adoption of technology based auditing (Martinez-Vazquez, 2011). Despite the positive effects that technology based internal auditing can bring to bear on internal audit effectiveness, the current level of adoption remains low (Ahmi, Saidin and Abdullah, 2014).

Thus, there is a need to develop a model to comprehensively evaluate the internal auditor’s technology adoption intention to support organisations in identifying the barriers to and facilitators of technology adoption, in order to develop suitable strategies to enhance technology adoption. The aim of this chapter is to develop a comprehensive framework of the factors that can influence the internal auditor’s intention to adopt information technology for the purpose of internal auditing. To identify the relevant factors for this framework, existing technology adoption models namely, the theory of reasoned action (TRA), the technology-organisation-environment (TOE) framework, the technology acceptance model (TAM) and the unified theory of acceptance and use of technology
(UTAUT) are examined. This chapter offers a review of the literature surrounding technology based internal auditing, technology adoption models, and factors which predict the usage of CAATs by internal auditors. The framework developed in this study will be utilised to examine the intention to adopt CAATs by internal auditors in government departments in the Sultanate of Oman.

3.2 Technology Based Internal Audit

Internal auditing within an organisation primarily includes practices and responsibilities that aim to evaluate organisational activities, improve control and risk management processes, review the efficiency of operations, and assess compliance with corporate governance guidelines (Hass, Abdulmohammadi, & Burnaby, 2006). Internal auditors are consistently working to improve the efficiency and effectiveness of business processes, and technology based auditing plays a crucial role in enhancing the quality of internal audit. In recent years, the number of companies using information technology for their daily business operations has significantly increased. Several studies have identified that the demand for technology based internal auditing, and an awareness of the increased audit effectiveness and efficiency associated with CAAT adoption, has resulted in increased usage of CAATs for auditing purposes (Curtis & Payne, 2014; Dowling & Leech, 2014). CAATs refer to the audit technologies used by internal and external auditors for auditing information systems in organisations (Curtis & Payne, 2008; Rosli, Yeow, & Siew, 2012). CAATs are a very useful solution to the heightened accountability and auditor workload in the current competitive environment (Debreceny, Lee, Neo, & Toh, 2005). Some of the practical benefits of CAATs when compared to manual audit techniques include the following. Firstly, CAATs enable the filtering of larger volumes of data. Secondly, they are also more effective when working with complex data, and thirdly, CAATs facilitate
easier identification of policy non-compliance and data entry and processing errors (Janvrin, Lowe, & Bierstaker, 2008). Curtis and Payne (2014) state that adoption of CAATs can reduce the total number of hours expended on auditing related activities, thus increasing the productivity of the audit function. According to Bloomfield et al., (2000), an effective technology adoption model has the capacity to effectively explain the reasons for failing to adopt technology, and should permit the development of strategies that can substantially enhance technology adoption. To develop a technology adoption framework suitable for an internal audit context, this research examined existing technology adoption models, and developed relevant factors that explain technology adoption in an internal auditing environment. The next section provides an overview of relevant technology adoption models.

3.3 Technology Adoption Models

There are several models which explain the decision to adopt new technology in an organisation including the theory of reasoned of action (TRA), the technology-organisation-environment (TOE) framework, the technology acceptance model (TAM), and the unified theory of acceptance and use of technology (UTAUT). These models are useful for managers trying to assess the likelihood of success of new technology introductions (Curtis & Payne, 2008). The UTAUT is an extension of the technology acceptance model (TAM) which was formulated by Venkatesh, Morris, Gordon and Davis (2003). The TAM is one of the most reliable models used to explain the user’s decisions to adopt technology (King & He, 2006). The following sections examine each of these technology adoption models in more detail.
3.3.1 Theory of Reasoned Action (TRA)

The theory of reasoned action (TRA) was developed by Ajzen and Fishbein (1980) to explain the influence of one’s attitude towards technology on the behavioural intention towards its adoption. Figure 3.1 presents the TRA model. Mishra, Akman and Mishra (2014) argue that the TRA represents an important fundamental conceptual framework for explaining and predicting human behaviour. According to the TRA, the internal auditor’s intention to adopt CAATs depends on his positive or negative evaluation of CAATs in his organisation, and his perception of social pressure regarding its adoption (Ajzen & Fishbein, 1980). Several studies have been conducted using the theory of reasoned action in the context of technology adoption (Jaafar, Ramayah, & Teng, 2008; Yousafzai, Foxall, & Pallister, 2010). Other studies have successfully utilised the TRA to examine individuals’ attitudes towards usage of computers (Godin et al., 2008; Nink, 2003).

Accordingly, the factors in the TRA are relevant to an examination of CAAT adoption intention. The TRA comprises four main constructs namely, attitude towards behaviour, subjective norms (SN), behavioural intention (BI), and actual behaviour (Mishra et al., 2014). The TRA suggests that intention to use a technology, called behavioural intention, is influenced by the individual’s attitude towards the behaviour of adopting technology and social pressure, which is termed the subjective norm (SN).
The constructs of TRA relevant to CAAT adoption are subjective norms and attitude towards behaviour. Subjective norms or social norms, refer to the organisational factors that influence the user’s perception regarding the use of IT (Mishra et al., 2014). Fishbein and Ajzen (1975) state that subjective norms represent the normative belief held about the expectations of others including friends, management, superiors and society at large. Thus, subjective norms consist of both organisational factors and environmental factors that influence the individual’s intention to adopt technology. In an organisational context, social norms include a range of formal and informal social controls within an organisation which drive individual behaviour (Horne, 2009). Social norms drive perceptions regarding the usefulness and ease of use of a technology, which in turn influence an individual’s intention to adopt technology (Dickinger, Arami and Meyer, 2008). The second construct termed attitude towards behaviour refers to the set of beliefs a person holds about technology which influences their intention to adopt that technology (Schwartz, 1992). In the TRA, attitude is an individual specific factor which emphasises the influence of individual factors on the intention to adopt technology (Mishra et al., 2014).
framework solely focuses on the individual attitude towards technology and its impact on behavioural intention to adopt technology (Ajzen and Fishbein, 1980). This model is useful to predict human behaviour which depends on their evaluation of the technology and their perception of the circumstances including organisation conditions and social norms (Ajzen & Fishbein, 1980; Horne, 2009). Thus, the TRA solely focuses on the individual attitude and perceptions concerning the organisational conditions, social norms and attitude towards the technology in predicting the behavioural intention to adopt technology. However, the TRA framework fails to consider factors external to the individual that influence the technology adoption intention. Since the TRA framework fails to consider the external factors such as technological, organisational and environmental factors that influence the adoption of technology, the TRA framework is considered to be insufficient for understanding technology adoption intention by internal auditors. The next section explains the TOE framework.

3.3.2 Technology-Organisation-Environment (TOE) Framework

The TOE framework was developed by Tornatzky and Fleischer in 1990, and identifies three factors namely, technological, organisational and environmental factors which determine technology adoption and implementation in an enterprise context (Tornatzky and Fleischer 1990). Figure 3.2 depicts the flowchart for the TOE framework. The technological factors incorporate both internal and external technologies relevant to the firm. The organisational factors refer to organisational characteristics including the managerial structure, internal resources, the area in which the business operates, as well as details of competitors and the industry (Pan and Jang, 2008). Environmental factors include various regulatory variables, scenarios specific to the professional group, and pressure from competitors (Racherla and Hu, 2008). The TOE model is a suitable
framework for examining the extent of technological innovation in organisations (Pan and Jang, 2008). Various studies have used different items for the technological, organisational and environment factors. For example, a study conducted by Kuan and Chau (2001) used perceived benefits and indirect benefits to examine the technological factor, whilst Oliveira and Martins (2008) used technology readiness and technology integration to examine the technological factor.

*Figure 3.2 Technology-Organisation-Environment Framework*

While most of the technology adoption models examine technology adoption from an individual perspective, the TOE framework examines technology adoption from an organisation perspective (Oliveira and Martins, 2011). Several studies that have examined technology adoption from an enterprise perspective have successfully utilised the TOE framework to examine technology adoption in the organisation (Kuan and Chau, 2001;
Oliveira and Martins, 2011; Pan and Jang, 2008). Since the focus of this research is on CAAT adoption from both an individual and enterprise perspective, the TOE framework is suitable to support the development of a technology adoption framework appropriate for examining CAAT adoption intention of internal auditors.

The TOE framework is suitable to understand technology adoption in an organisation (Tornatzky and Fleischer 1990). Although the TOE framework addresses a drawback associated with many technology adoption models by focusing more on the organisational and environmental factors that influence the technology adoption (Kuan and Chau, 2001; Oliveira and Martins, 2011; Pan and Jang, 2008), the model nonetheless fails to consider the individual factors that influence technology adoption. Since the TOE framework fails to incorporate the individual level factors that influence the technology action, the TOE framework is regarded as insufficient in predicting the intention to adopt CAATs in an internal audit context. The next section examines the technology acceptance model (TAM). According to Davis, Bagozzi, & Warshaw (1989), the TAM is considered capable of explaining user behaviour across a broad range of end-user computing technologies and user populations.

3.3.3 Technology Acceptance Model (TAM)

The technology acceptance model (TAM) was proposed by Davis (1989) to explain the user’s behavioural intention towards technology adoption. Figure 3.3 shows the technology acceptance model. According to the TAM, there are two predictors of behavioural intention to adopt technology namely, perceived usefulness (PU) and perceived ease of use (PEU) (King and He, 2006). The TAM is a widely accepted model for understanding IT adoption and usage processes (Carlos Martins Rodrigues Pinho &
Soares, 2011). This model explains many of the differences in behavioural intentions of users relating to the adoption of IT, and has been used in a wide variety of contexts (Davis et al., 1989). It predicts a user’s acceptance of IT, its usage on the job, and explains the determinants of user acceptance of a wide range of end-user computing technologies (Davis et al., 1989; Rauniar, Rawski, Yang, & Johnson, 2014). The TAM assumes that user acceptance is driven by the user’s attitude towards the technology, and, that the user’s attitude is a function of the perceived usefulness (PU) of the technology, and the perceived ease of use (PEU) of the technology (Rauniar et al., 2014).

PU, and PEOU are the two essential drivers of the TAM (Carlos Martins Rodrigues Pinho & Soares, 2011). Perceived usefulness is defined as the degree to which a person believes that using a particular system will enhance his or her job performance, whilst perceived ease of use is defined as the degree to which a person believes that using a particular system will be free from effort (Davis et al., 1989). Since the two primary predictors of TAM examine the personal beliefs of the individual, the factors in the technology acceptance model specifically examine individual factors.
Although TAM is widely recognised for its understandability and simplicity, there are several criticisms of this model. A key criticism of the TAM is that it is imperfect, and does not encompass other predictor variables that influence behavioural intention to adopt technology, resulting in wide variations in the predicted effects of the TAM (King and He, 2006). Contextual factors (Straub, Keil and Brenner, 1997), organisational expectations (Venkatesh et al., 2003), technology characteristics (Plouffe, Hulland and Vandenbosch, 2001), prior experience (Oh, Ang and Kim, 2003) and subjective norms (Hardgrave, Davis and Riemenschneider, 2003) are all significant categories of predictors that were identified to influence an individual’s behavioural intention to adopt technology, yet, these are not present in the TAM.

The TAM only allows the prediction of user acceptance of technology based on the user attitude towards the perceived usefulness of technology on the job and perceived ease of use of technology (Carlos et al., 2011). Thus, this model is limited to the individual acceptance of technology based on their perception and attitudes. A wide range of factors including contextual factors, organisational factors and technological factors that influence
technology adoption are excluded from the TAM. Hence, the TAM does not provide a comprehensive framework to predict the CAAT adoption intention of internal auditors. The unified theory of acceptance and use of technology (UTAUT) is an extension of the TAM, and incorporates other predictors that can influence the behavioural intention of an individual to adopt technology. The next section examines the UTAUT.

3.3.4 The Unified Theory of Acceptance and Use of Technology (UTAUT)

The unified theory of acceptance and use of technology (UTAUT) was developed by Venkatesh et al., (2003) after a comprehensive review of eight models developed to explain user acceptance and adoption of technology. Figure 3.4 shows UTAUT model. The UTAUT is considered the most widely applied, comprehensive, and empirically tested model to examine user acceptance and adoption of technology (Al-Shafi and Weerakkody, 2010). The UTAUT consists of four independent constructs that influence technology adoption intention namely, performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC). Other independent variables in the UTAUT model that influence behavioural intention are gender, age, experience and voluntariness of use.
Khechine, Lakhal and Ndjambou (2016) conducted a meta-analysis of studies that used the UTAUT and found the theory to be robust in predicting user acceptance and adoption of technologies. The UTAUT has been applied in a variety of settings including telecommunications, banking, healthcare, education, and government services (Khechine et al., 2016). An evaluation of studies that have used the UTAUT to examine the user’s intention to adopt technology reveal that it is mainly used in studies were an individual’s decision has the most significant influence on technology adoption. For example, the study conducted by Gholami, Ogum, Koh and Lim (2010) used the UTAUT to identify the factors that influence a customer’s decision to adopt e-payments. Similarly, a study by Carter, Shaupp, Hobbs and Campbell (2011) examined the taxpayer’s intention to use an electronic tax filing system using the UTAUT. In both cases, individual factors in the

Source: Venkatesh et al., (2003, p. 447)
UTAUT were sufficient to examine technology adoption since organisational, technological and environmental factors did not play a significant role in the user’s acceptance of technology. Other studies that needed to be examined in an organisational context utilised a modified version of the UTAUT to suit the particular organisational context. For example, Kijsanayotin et al., (2009) used a modified version of the UTAUT to understand the factors that influence health care professionals’ intentions to use health care technology in community health centres.

Although the UTAUT can significantly predict the technology adoption behaviour of an individual, other relevant factors such as technological, organisational and environmental factors are not considered by this model. UTAUT is a widely used framework to predict technology adoption as it examines the individual factors that influence user acceptance of technology (Khechine et al., 2016). This model is considered to be most suitable when the individual is mainly responsible for adopting technology (Carter et al., 2011; Gholami et al., 2010). For this reason, the UTAUT model is considered to be insufficient to determine technology adoption in an internal audit context as studies have shown the influence of organisational, technological and environmental factors that influence the adoption of technology. Accordingly, the framework developed in this research had to overcome weaknesses of the existing models and create a comprehensive framework that covered the factors having a significant impact on the internal auditor’s intention to adopt technology. The next section explains the factors that are recognised as having a significant impact on the internal auditor’s intention to adopt CAATs.
3.4 Factors Predicting Usage of CAATs

Utilisation of IT has a strong influence on the quality, effectiveness, and efficiency of the internal audit function (Curtis & Payne, 2014). Research shows that there are a number of factors that influence the decision to utilise CAATs (Rosli et al., 2012). The factors that predict the usage of CAATs in this research are developed from the four technology adoption models discussed in this chapter. Each of the technology adoption models identified focused on a different level or construct but failed to provide a comprehensive framework to predict technology adoption. Accordingly, the aim of this research is to overcome the weaknesses of the existing technology adoption models by developing a comprehensive framework to predict CAAT adoption intention of internal auditors.

The TRA framework developed by Ajzen and Fishbein (1980) uses individual constructs. The main weakness of the TRA framework is that the behavioural change or technology adoption intention is viewed as being within the complete control of the individual, and so external factors such as organisational and technological factors are not assigned importance (Haider, 2005). The TOE framework developed by Tornatzky and Fleischer (1990) involve constructs of a technological, organisational and environmental nature. The main weakness of the TOE framework is the lack of consideration for the role of individual factors on behavioural change or technology adoption intention (Mehdi, 2013). The TAM developed by Davis (1989) uses individual factors only, which is a limitation of the model. Finally, the UTAUT developed by Venkatesh et al., (2003) provides a comprehensive list of individual factors that influence technology adoption. However, the UTAUT is chiefly an individual level model for predicting technology adoption. Accordingly, other factors examined in technology adoption models such as those examined in TOE are not included in the UTAUT. The T-O-E-I Framework is considered superior to the TAM, TOE, TRA...
and UTUAT as it represents a more comprehensive model encompassing all major factors that influence technology adoption intention at an individual and enterprise level. Existing models on technology adoption including the TAM, TOE, TRA and UTUAT have either focused on enterprise level factors or individual level factors that influence technology adoption. The T-O-E-I Framework overcomes the weaknesses in the existing models by focusing on both enterprise level and individual level factors that influence technology adoption intention. The framework developed in this study involves the four main factors which influence the user’s intention to use CAATs, namely (1) technology factors, (2) organisational factors, (3) environmental factors, and (4) individual factors. The following section provides a detailed explanation of these four factors.

3.4.1 Technology Factors

Technology factors affect a user’s perception of the usefulness and ease of use of a system (Moorthy et al., 2011). The technology-organisational-environmental (TOE) framework is a recognised model developed by Tornatzky and Fleisher (1990) which examines adoption of IT at the organisation level. As per the TOE framework, technological factors that influence the intention to adopt CAATs include the costs and benefits of using technology, the technology task fit, and the potential risks of using technology (Gangwar et al., 2015). According to Curtis and Payne (2014), the decision to adopt CAATs must be based on a comparison of the expected costs and benefits. Various studies on the performance of technology are measured based on a comparison of its costs and benefits (Awa, Nwibere, & Inyang, 2010). In fact, the risks and benefits of using technology are two key factors that influence the decision to use CAATs (Weidenmier & Ramamoorti, 2006). The following sections consider the benefits and risks of using CAATs for performing the internal audit.
3.4.1.1 Benefits of Technology for Internal Audit

The unprecedented growth of technology in financial markets has increased the demand for internal auditors with the knowledge and understanding of the organisation’s information systems, computer environment, and processing and related controls (Braun & Davis, 2003). In response to the altered financial environment since the financial crisis, the Public Oversight Board (POB) of the United States (US) has issued new statements on auditing standards. There is a need for increased usage of technology in the audit process to obtain sufficient appropriate evidence when organisational data exists in electronic form (Braun & Davis, 2003). Internal auditors can review an organisation’s systems, information, and activities more efficiently using computer assisted auditing, and this increases the effectiveness and productivity of the internal audit function (Weidenmier & Ramamoorti, 2006). The use of IT has also become an essential means of keeping abreast of advances in professional standards and best practice. Non-electronic data is gradually becoming scarce owing to developments such as electronic data interchange (EDI), point of sale (POS) systems, and business to consumer (B2C) electronic commerce (Braun & Davis, 2003). Failure to utilise technology for internal auditing increases the risk of falling behind the current trend of high-quality assurance activities facilitated by technology (Norton, 1995).

CAATs increase the level of assurance provided on the assertions given by internal auditors through well-designed audit processes which help to identify business risks, financial risks, compliance risks, and operational risks (Curtis & Payne, 2014). CAATs allow the automation of audit and control testing procedures, including ongoing monitoring of certain internal controls, thereby increasing the efficiency and effectiveness of the internal
audit function. Highly competent internal audit professionals are essential for utilising the technology required to ensure internal audit effectiveness and productivity (Curtis & Payne, 2014). However, Braun and Davis (2003) argue that the skills required by internal auditors to operate CAATs depend on the type of CAAT used. For example, the use of an integrated test facility (ITF) requires expertise on the part of internal auditors to design audit modules into the system, whereas the use of generalised audit software (GAS) is more straightforward and requires minimal technical expertise.

Increased usage of CAATs can improve the efficiency and effectiveness of the internal audit function. This is because use of audit software not only increases the scope of the transactions analysed, it also reduces the marginal cost (Braun and Davis, 2003). According to Braun and Davis (2003), regulatory actions by the US based Securities Exchange Commission (SEC) have increased the demand for audit efficiency by reducing the time allowed to audit public companies. Computer assisted audit techniques (CAATs) are used by internal auditors to increase audit efficiency in time constrained situations without adversely affecting the effectiveness of the audit (Braun & Davis, 2003).

The technological benefits associated with CAAT usage also depends on the degree of task fit of the technology. Adopting the most appropriate technology to perform the task yields the greatest benefit from using IT (Marsh & Flanagan, 2000). Task-technology Fit (TTF) is a significant predictor of the efficient and effective results from use of technology (Goodhue & Thompson, 1995). This means that better internal auditing results can only be achieved when there is task-technology fit. Better results from CAATs influence the perception of usefulness of technology, which in turn influences the decision to adopt CAATs. Goodhue and Thompson (1995) conclude that better task technology fit leads to
better performance and therefore, is a direct antecedent to the internal auditor's attitude towards using CAATs.

3.4.1.2 Technology Risks for Internal Audit

Technology risks refer to the risks that are perceived to arise from the use of CAATs such as computer fraud, and the threat of deficiencies within controls (Rosli et al., 2012). The level of technology risk is a major predictor of technology acceptance behaviour (Lam, Chiang, & Parasuraman, 2008). The systems used for audit processes and documentation determine the effectiveness of the internal audit. Ineffective audit systems are a major technological risk to internal audit effectiveness and productivity (Rosli et al., 2012). Concern regarding technological risks such as information privacy issues, collapse of networks, and data loss adversely affect the decision to adopt a new technology (Wells, Campbell, Valacich, & Featherman, 2010). Rosli et al. (2012) suggest that by identifying material risks and addressing them through effective risk management strategies, technology acceptance among users can be improved. The next section considers the organisational factors that influence CAAT adoption intention.

3.4.2 Organisational Factors

As per the TOE framework (Tornatzky and Fleischer, 1990), organisational factors embody the resources and characteristics of the firm including its scope, size, management support, and managerial structure. An organisation's internal audit resources have a significant impact on the strength and effectiveness of its internal audit function (Seol, Sarkis, & Lefley, 2011). Top management holds the highest position in the organisational hierarchy and therefore significantly influences decisions taken surrounding technology adoption (Rosli et al., 2012). This is because top management is responsible for creating
a favourable environment for adopting CAATs by internal auditors (Rosli et al., 2012). When the organisational environment including training support and technology resources are insufficient to adopt CAATs, this influences the internal auditor’s intention surrounding CAAT adoption. Organisational factors that constrain or facilitate the adoption of CAATs include top management support and pressure from management (Rosli et al., 2012). These will be considered next.

3.4.2.1 Top Management Support

Top management support is an essential element for CAAT adoption. Premkumar and Ramamurthy (1995) emphasised the role of top management support in technology acceptance in an organisation. Rosli et al. (2012) describe top management support as the degree of top management involvement and encouragement in CAAT adoption. Curtis and Payne (2008) recognise the influence of top management support in the internal auditor’s decision to use new technology. Incorporating IT as part of the internal audit process requires the support of top management because the successful implementation of technology involves setting objectives, planning, system design, process improvement, and collaborative processes, all of which require top management involvement (Moorthy et al., 2011). The organisation’s decision to adopt a new technology depends on the ability of that technology to produce better results compared to existing technology (Premkumar & Ramamurthy, 1995). Lotto (2013) notes that the absence of top management support prevents the adoption of IT in internal auditing. This is because the decision to adopt and implement a new technology is so dependent on top management support. According to Alkebsi, Aziz, Mohammed and Dhaifallah (2014), top management support may take many forms including authorising access to data and facilitating communication with management. Management who are supportive of evaluating and extending IT audit
systems can increase the level of adoption of IT for the internal audit process (Alkebsi et al., 2014). The next section explains how pressure from management influences technology acceptance.

### 3.4.2.2 Pressure from Management

The type of pressure from management influences the adoption of CAATs. For example, if management does not favour technology adoption, this adversely affects technology adoption for internal audit. The perception of managers about the use of technology for internal audit influences the use of CAATs for internal auditing (Dowling & Leech, 2014). A study conducted by Bierstaker et al. (2014) identified that pressure from management influences the likelihood of auditors adopting CAATs. This is because the increased outcome expectations of management may force internal auditors to rely on CAATs to perform internal auditing more efficiently (Bierstaker et al., 2014). For example, the scope of the internal audit function has increased dramatically over the past decade with internal auditors now responsible for areas including fraud detection, risk management, and identifying areas for operational improvements to enhance financial performance. The use of CAATs allows internal auditors to perform these functions more efficiently. This has resulted in increased management pressure to adopt IT based audits (Zwaan, Stewart, & Subramaniam, 2011). The next section discusses key environmental factors that influence CAAT acceptance amongst internal auditors.

### 3.4.3 Environmental Factors

Environmental factors in an internal audit context include pressure from the audit regulatory bodies and industry. The environmental context presents both opportunities and constraints for adopting CAATs (Oliveira & Martins, 2011). Two important
environmental pressures that influence the adoption of CAATs in internal auditing are auditor independence and audit time pressure. Internal auditors are responsible for providing assurance about their audit engagements, thus rendering auditor independence an important environmental factor (Curtis & Payne, 2008). Furthermore, the need to perform auditing efficiently within the budgeted hours represents another environmental pressure experienced by internal auditors (Rosli et al., 2012). These environmental factors are examined in more detail below.

3.4.3.1 Auditor Independence

The independence of the internal auditor has a significant influence on the quality of the audit (Canning & Gwilliam, 1999). According to Boyle and Canning (2005), the self-review threat recognises that auditor independence may be diminished if auditors are left to review their own work. Similarly, self-interest and familiarity threats are equally detrimental to auditor independence and negatively affect auditor performance. Computer frauds are relatively easy to perpetrate, but often difficult to prevent (Moorthy et al., 2011). Accordingly, a lack of auditor independence can adversely impact the effectiveness of CAATs (Moorthy et al., 2011). Nevertheless, CAATs bear the capacity to strengthen internal auditor independence by automating audit functions within organisations, and providing repeatable computerised techniques (Moorthy et al., 2011).

The quality of the service provided by the internal audit function depends on the independence and objectivity of internal auditors (Moorthy et al., 2011). Furthermore, independence of internal auditors, coupled with effective IT based internal audits can help reduce external audit costs by allowing external auditors to cooperate with and rely more heavily on the work performed by internal auditors (Hall, 2010). George-Silviu (2014)
notes that although internal auditors are typically employees of the organisation, their independence within the company is of the utmost importance for internal control effectiveness. Organisations rely on internal auditors to evaluate the effectiveness and adequacy of internal controls, and to manage risks and uncertainties (Zwaan et al., 2011). Usage of CAATs enable internal auditors to effectively examine data provided by management personnel and identify suspicious transactions more easily (Byrnes et al., 2012). CAATs are regarded as an effective solution to improve auditor independence by overcoming the judgement bias encountered during traditional manual audits (Byrnes et al., 2012). Ensuring auditor independence is a fundamental element of effective external and internal auditing. The effects of audit time pressure will be considered now.

3.4.3.2 Audit Time Pressure

Time pressure is a significant determinant of internal audit effectiveness. According to McDaniel (1990), lower time pressure allows the creation of structured audit programmes, which in turn increase the effectiveness of the internal audit process. This is because inefficiencies can result in increased costs and reduced audit effectiveness (McDaniel, 1990). To improve audit service quality when there are limited resources and time, internal audit professionals have increasingly turned to technology to achieve a value added internal audit function (Curtis & Payne, 2008). Janvrin et al., (2008) found that completing tasks within the time limit set is one the most significant advantages of CAATs.

One of the most frequently reported issues associated with manual internal auditing is the significant time delays associated with information collection, processing and reporting activities (Byrnes et al., 2012). However, effective implementation of technology within internal auditing is necessary to reap the associated benefits when faced with time pressure
First time adoption of technology based internal audits is understandably costly because internal audit staff require training and time to perform tasks particularly during the initial periods of implementation owing to the steep learning curve (Curtis & Payne, 2008). Accordingly, it is more difficult for first time adopters to use CAATs effectively when exposed to time pressure (Curtis & Payne, 2008). In a situation where there is time pressure, and the adoption of CAATs is optional, the decision to use technology will be based on an evaluation by the audit manager and auditor in charge of factors such as the expected effectiveness of the internal audit, level of experience of internal audit staff, and the perceived ease of use of the technology (Curtis & Payne, 2008). The next section considers the key individual level factors that influence CAAT acceptance behaviour among internal auditors.

3.4.4 Individual Factors

Despite the rapid growth in information systems and audit regulations, adoption of CAATs by individual auditors remains relatively low (Curtis & Payne, 2008). Individual level factors such as user confidence, technical competencies, performance expectancies, effort expectancies, facilitating conditions, social influence, and motivational factors, are all regarded as significant predictors of IT acceptance (Gangwar, Date, & Ramaswamy, 2015). In a study conducted by Braun and Davis (2003), internal auditors of government organisations were found to lack the confidence required to use CAATs despite knowing the potential benefits of doing so. This demonstrates the influence of individual level factors on the CAAT adoption intention. The unified theory of acceptance and use of technology (UTAUT), which is a model of technology adoption proposes five individual factors to determine IT acceptance. The UTAUT was developed from an empirical comparison of eight technology acceptance models which were examined in research.
surrounding user acceptance of IT (Venkatesh et al., 2003). The UTAUT consists of five independent constructs that influence technology adoption intention namely, (1) technological readiness; (2) user expectations about system performance, termed performance expectancy (PE); (3) user perceptions about the effort needed to use the new system, termed effort expectancy (EE); (4) user perceptions concerning whether individuals important to them encourage system use, termed social influence (SI), and; finally (5), user expectations regarding the existence of an organisational and technical infrastructure, to support system use, termed facilitating conditions (FC) (Venkatesh et al., 2003). Rosli et al., (2012) propose that the UTAUT is a useful underlying theory to determine an individual auditor’s CAAT acceptance and adoption intention. A review of each of these five factors is provided next.

3.4.4.1 Technology Readiness

The technological readiness of an organisation influences the decision of internal auditors to use CAATs (Moorthy et al., 2011). Similarly, the technological readiness of an organisation determines the cost of implementing IT based internal auditing, thus influencing the decision to adopt IT for the internal audit process (Lotto, 2013). Providing the necessary IT infrastructure, maintenance, and training support is evidence of an organisation’s readiness to adopt CAATs (Rosli et al., 2012). Financial and technological resources can equip an organisation with the internal environment necessary to support CAAT usage (Rosli et al., 2012). According to Venkatesh, et al., (2003) organisations that are ready for CAAT adoption increase their internal auditors’ motivation by providing appropriate staff training and technology maintenance support. Nance and Straub (1996) found that a lack of experience and training in CAATs can result in internal auditors failing
to make the IT choices that best fit the task, which in turn may lead to inferior audit performance.

Technology readiness determines how capable a company and its employees are in adopting an innovation (Iacovou et al., 1995; Parasuraman, 2000, Kuan and Chau, 2001 Parasuraman & Colby 2005). Technology readiness of an individual is developed from four personality dimensions namely, optimism, innovativeness, discomfort and insecurity (Godoe & Johansen, 2012). The Technology Readiness Index (TRI) created by Parasuraman (2000) measures consumers’ enduring openness to utilise new technologies. While optimism and innovativeness are two mental enablers to utilise technologies, discomfort and insecurity represent two mental inhibitors to the adoption of technologies. This is depicted in Figure 3.5.

Figure 3.5 Multiple dimensions of Technology Readiness

![Diagram](image)

Source: Developed from Parasuraman (2000, p.308)
All four dimensions are independent, and the scores for these dimensions determine technology readiness. A high score for innovativeness and optimism leads to better technology readiness, while a high score for discomfort and insecurity leads to reduced technology readiness (Godoe and Johansen, 2012). The four personality dimensions that determine technology readiness are examined in detail next.

**Optimism and Innovativeness**

Optimism relates to a positive view of technology, and a belief that technology offers people increased control, flexibility, and efficiency. Başgöze (2015) defined optimism as a person’s tendency to think that using new technology will yield positive results throughout life. According to Rogers (1993), technological innovations that consumers perceive as having greater relative compatibility, advantage, trialability, and observability, while having less complexity, are more likely to be adopted compared to technologies that do not. Optimism in this context refers to the positive feeling people have about technology (Godoe and Johansen, 2012). Literature on technology diffusion asserts that a positive view of technology is important at the initial or awareness stage, and may affect the decision to adopt or reject a technology (Iacovou et al., 1995). Top management’s optimism concerning the relative advantages of web based technology facilitates the adoption of similar technologies that are perceived as being better or which supersede existing technologies (Kuan and Chau, 2001; Teo and Pian, 2004). Innovativeness refers to a tendency to be a technology pioneer and thought leader (Parasuraman, 2000). This means that an innovative person perceives themselves to be at the forefront of technology adoption (Godoe and Johansen, 2012). How someone reacts to an innovation is determined by that person’s perceived novelty about the idea or product. If the individual perceives the item as new then, it is an innovation. Rogers (1993) adds that newness is not limited
to new knowledge. An individual can know about an innovation but may not have developed an attitude to accept or reject it. Innovation Diffusion Theory (Rogers, 1993) operates on a more complex group of beliefs that are used to make predictions surrounding technology adoption.

In 1982, Tornatzky and Klein performed a meta-analysis of over 100 innovation studies that identified ten innovation attributes. Of those ten attributes, compatibility, complexity, and relative advantage were the only attributes that were consistently associated with adoption or utilisation decisions. Karahanna, Agarwal, and Angst (2006) assert that compatibility is an important attribute relevant to technology acceptance behaviours. Compatibility assesses the extent of congruence between a new technology and various aspects of the individual and the situation in which the technology will be utilised.

Innovativeness indicates a person’s propensity to be a technology pioneer (Badri, AlRashedi, Yang, Mohaidat, & Al-Hammadi, 2014). Gefen and Straub (2000) found that innovators and early adopters adopt e-commerce because of its intrinsic value such as perceived ease of use, and strategic advantage. The study conducted by Godoe and Johansen (2012) to examine the association between the personality dimensions of optimism and innovativeness, and the dimensions of the technology acceptance models, revealed that optimism and innovativeness positively influence the perceived ease of use and perceived usefulness of a technology. This means there is a higher chance for technology adoption when there is optimism and innovativeness. Thus, optimism and innovativeness are positive drivers of technology readiness (Godoe and Johansen, 2012).
Discomfort and Insecurity

Discomfort and insecurity are considered inhibitors to technology readiness (Colby et al., 2004). The discomfort scale refers to a person’s perceived inability to use technology, and the feeling that technology will overwhelm them. People who have high discomfort scores think that their knowledge of the new technology is insufficient. That belief causes them to feel depressed. Discomfort reflects a person’s anxiety about a given technology. It may cause them to think that they are not capable of having adequate expertise on that technology. This mind-set can cause them to worry, and believe that the new technology is not appropriate for them. This results in the individual avoiding that technology (Sophonthummapharn & Tesar, 2007).

Insecurity refers to a person’s distrust of technology, and that person’s scepticism about its capability to work (Badri, Al-Rashedi, Yang, Mohaidat, & Al-Hammadi, 2014; Parasuraman et al., 2000). Parasuraman (2000) explains that insecurity is when a person does not trust a new technological product and does not believe that the new technology will accomplish the given task. When someone has doubts about a new technology, this causes that individual to avoid using it. Doubt can stem from sceptical attitudes a person holds against a new technology (Walczuch, Lemmink, & Streukens, 2007).

Several studies have recognised the discomfort and insecurities associated with the adoption of new technologies (Doherty et al., 1999; Pavlou and Gefen, 2004). From an online business to business (B2B) perspective, institutional mechanisms such as escrow services and guarantees have been found to mitigate perceptions of risk in using technology (Pavlou and Gefen, 2004). Doherty et al., (1999) found that retailers’ engagement of external expertise via consultants facilitated adoption. In conclusion, positive and negative
beliefs about technology may coexist, and people can sit along a technology belief continuum from a strongly positive attitude at one end to strongly negative attitude at the other. The correlation between people’s technology readiness and their propensity to employ technology is empirically confirmed by Parasuraman (2000).

3.4.4.2 Performance Expectancy (PE)

Performance expectancy (PE) is defined as the degree to which an individual believes that using a system will help him to realise improvements in job performance (Venkatesh et al., 2003). Accordingly, an internal auditor’s expectation that his performance is likely to improve by using CAATs is likely to increase his chance of CAAT adoption (Curtis & Payne, 2014). Curtis and Payne (2014) found that performance expectancy is a significant predictor of CAAT adoption by individual auditors. The idea is that users will wish to perform an activity because it is regarded as instrumental in achieving valued outcomes distinct from the activity itself, such as improved job performance, better pay, and job promotions (Dowling & Leech, 2014). In fact, the usefulness of technology in achieving one’s goals is considered the most significant predictor of technology acceptance for auditors (Dowling & Leech, 2014).

3.4.4.3 Effort Expectancy (EE)

Effort expectancy (EE) refers to the degree of ease associated with using a system (Venkatesh et al., 2003). According to Venkatesh et al., (2003) the acceptance and attitude of individuals towards CAATs depends on their perceived usefulness (PU) of the technology, as well as the perceived ease of use (PEU) associated with it. Ease of use of CAATs depends on the IT training provided to the internal auditor; a factor which bears the capacity to influence effort expectancy (Janvrin et al., 2008). Lack of user confidence
adversely affects adoption of CAATs (Curtis & Payne, 2014). Accordingly, training programmes have the ability to increase the internal auditor’s ease of use of CAATs, thus resulting in increased adoption of them (Janvrin et al., 2008).

### 3.4.4.4 Social Influence (SI)
Social influence (SI) refers to the degree to which an individual perceives that important others believe he should use the new IT system (Venkatesh et al., 2003). Curtis and Payne (2008) note that the internal auditor’s perception of his direct manager’s support for using CAATs influences his decision to adopt CAATs. Leadership has been described as a mode of social influence in which one person can enlist the aid and support of others in the accomplishment of a common goal. Using this description the individual leads by guiding and directing others (Landis, Hill, & Harvey, 2014). Leadership is also defined as organising a group of people to achieve a common objective (Landis et al., 2014). Indeed, all five factors considered namely, technology readiness (TR), performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC) contain the explicit or implicit notion that the individual’s behaviour is influenced by the way in which he believes others will view him as a result of having used the technology (Venkatesh et al., 2003).

### 3.4.4.5 Facilitating Conditions (FC)
Finally, facilitating conditions (FC) refer to the degree to which an individual believes that the organisational and technical infrastructure exists to support his usage of an IT system (Venkatesh et al., 2003). Facilitating conditions may vary depending on the setting and type of technology application (Aypay, Celik, Aypay, & Sever, 2012). In an internal audit context there are internal and external facilitating conditions which influence the auditor's
readiness to adopt CAATs. External facilitating conditions include organisational support, organisational characteristics, training programs and support services (Hart & Henriques, 2006). Internal facilitating conditions include the auditor’s own skills and knowledge (Mahzan & Lymer, 2014).

In general, facilitating conditions refer to an individual’s perception regarding the availability of technological and or organisational resources such as knowledge, which can remove barriers to using an IT system and increase one’s desire to adopt the system (Curtis & Payne, 2014). Facilitating conditions play a significant role in the adoption and diffusion behaviour among users of information systems (Aypay et al., 2012). Facilitating conditions such as training and technological support have been identified as being able to create a positive perception about information systems among users (Aypay et al., 2012). A study conducted by Mahzan and Lymer (2014) found that adoption of CAATs was higher when the internal auditor had previous experience or a basic knowledge about the usage of CAATs. Targeted training to develop the skills and knowledge of internal auditors positively influences the auditor’s intention to adopt CAATs (Mahzan & Lymer, 2014).

Facilitating conditions for adopting CAATs in an audit context include having the appropriate CAAT resources, computer support for employees, technical support, training and appropriate user guidelines (Abraham, Junglas, Watson, & Boudreau, 2015). There are five facilitating conditions that influence the adoption of IT applications namely, internal support, external support, top management support, organisational support characteristics, and CAAT support characteristics (Hart & Henriques, 2006). A study conducted by Janvrin et al., (2008) identified that facilitating conditions for CAAT usage
significantly influence CAAT adoption. It is therefore necessary for management of an organisation to provide the organisational and technical infrastructure to facilitate the adoption of CAATs (Curtis & Payne, 2014). Thompson et al., (1991) explain that facilitating conditions make the overall organisational environment, including the provision of computer support, favourable for implementing computer assisted internal auditing. Facilitating conditions influence the adoption of CAATs by affecting the internal auditor’s perception of the perceived ease of use and perceived usefulness of the IT application for internal audit.

3.5 Conclusion

This chapter examined the importance of technology adoption in internal auditing. The modern business environment is becoming increasingly complex and more businesses are adopting information technology to conduct their day to day operations. This has resulted in an increased demand for internal auditors to adopt technology for internal auditing. However, technology based auditing tools such as CAATs has not received adequate attention from internal auditors. Considering the significance of technology based auditing in an internal audit environment, this chapter emphasises the need to develop a comprehensive conceptual framework to examine the internal auditor’s intention to adopt CAATs. Existing technology adoption models including the TRA, the TOE, the TAM and the UTAUT were all examined in detail with a view to developing a comprehensive framework relevant to the internal audit environment. The internal auditor’s intention to adopt information technology is not only influenced by individual factors but also by a variety of enterprise level factors. Hence, based on the existing technology adoption models, four constructs were identified and developed which incorporate both individual
and enterprise level factors to comprehensively measure the internal auditor’s intention to adopt technology.

The factors that were identified to impact the internal auditor’s intention to adopt CAATs are technology, organisation, environment and individual level factors. The technological factors examine the benefits and risks associated with CAATs. The organisational factors focus on top management support and pressure from management. The environmental factors examine time pressure and audit independence. Finally, the individual level factors examine technological readiness, performance expectancy, effort expectancy, facilitating conditions and social factors.

The framework developed in this study will be utilised to examine the factors influencing the internal auditor’s intention to adopt CAATs in the audit departments of the Royal Court Affairs (RCA), the Royal Army of Oman, and the State Audit Institution (SAI) of Oman. This context of this study is Oman, and the adoption of CAATs among internal auditors in the public organisations in Oman is the focus of this work. To gain a richer understanding of the specific context of this research, the next chapter discusses the institutional context in Oman, and its system of Public Finance Management (PFM).
4. Institutional Context of Oman

4.1 Introduction

Institutions play a major role in shaping the policies and procedures of a country (Tyson, 2014). Depending on the institutional context of a country, the nature of auditing policies and practices can vary. The institutional context of a country comprises a range of factors including institutional arrangements (Rodriguez-Pose and Wilkie, 2017), the regulatory environment (Égert, 2014) and ethics (Baïada-Hirèche & Garmilis, 2016). Institutional arrangements refer to the policies, institutions, systems and processes that govern, manage, legislate and plan state activities, to fulfil the country’s mandate (United Nations Development Programme, 2015). The swift and remarkable economic growth in Oman has resulted in considerable changes in its institutional arrangements, as well as its cultural and economic context (Common, 2011).

The institutional context of the auditing profession in Oman has been continuously developing in recent decades (Anderson-Gough, Grey, & Robson, 2002). Institutional arrangements, and accounting and auditing regulations must all develop in line with economic advances, since such advances increase the need for new forms of control (Mennicken, 2008). Financial irregularities and financial collapses increase the need for tighter accounting and auditing regulations (Al Matari, Al Swidi, & Fadzil, 2014). The institutional context in which auditors work has a significant impact on their performance and decision-making (Thorne, Massey, & Magnan, 2003). For example, the highly regulated institutional context of the United States (US) creates a more effective auditing environment than a country such as Canada, which has less authoritative regulations (Thorne et al., 2003). Understanding the role of the different bodies that represent the overall institutional context of auditing in Oman is necessary in order to examine the
adoption and implementation of auditing practices, including computer assisted audit techniques (CAATs). To appreciate the institutional context of auditing in the area of the state and federal institutions of Oman, it is necessary to first consider the key components of the institutional context, including the institutional arrangements, public finance management (PFM), the regulatory environment, cultural factors and the ethical context. The three public institutions that have a direct influence on the audit of state and federal organisations in Oman are the State Audit Institution (SAI), the Royal Court Affairs (RCA), and the audit department of the Royal Army of Oman (RAO). The following sections provide an overview of Oman, including the country’s system of public financial management, its regulatory environment, the key audit institutions responsible for auditing the state organisations of Oman, as well as the ethical context of the country.

4.2 Background to Oman

Oman is a developing country with a population of 3.9 million people. The country’s official language is Arabic (Mohammed, 2017). Oman is currently experiencing the fastest population growth rate since 1960 (Varghese et al., 2016). The average annual population increase in Oman for the four years from 2011 to 2014 is 9% (The World Bank, 2015). The following sections provide contextual information about Oman, including details concerning its geographic, political, economic and administrative structures, national and organisational culture, international affairs and government accounting.

4.2.1 Geographic Structure of Oman

Oman, officially known as the Sultanate of Oman, is an Arab state in the south-eastern corner of the Arabian Peninsula, bordered by Saudi Arabia, Yemen and the United Arab Emirates (UAE), and overlooking three seas, namely, the gulf of Oman, the Persion Gulf,
and the Arabian Sea. It lies on the Tropic of Cancer. Oman has a 1,700 kilometre coastline extending from the narrow Strait of Hormuz in the north, to the borders of the republic of Yemen in the south. As a gateway between the Indian Ocean, east Africa, and the Arabian Gulf, Oman’s location has always been of strategic importance. The land area of Oman is 309,000 square kilometres. Figure 4.1 provides the map of Oman.

![Figure 4.1 Map of Oman](http://www.lahistoriaconmapas.com/atlas/map-political/Oman-political-map.htm)


4.2.2 Political and Administrative Structure of Oman

One of the main features of the political environment of Oman, is that political authority is mainly concentrated in the hands of one person, Sultan Qaboos bin Said al Said (Katz, 2004). The Sultanate of Oman consists of eleven regions, also known as governorates (Gresh, 2015). The eleven governorates play a crucial role in supporting the Sultan and
the Sultanate in the development journey of the country (Gresh, 2015). The eleven governorates are Ad Dakhiliyah, Al Batinah North, Al Buraimi, Ad Dhahirah, Al Batinah South, Al Wusta, Ash Sharqiyah North, Ash Sharqiyah South, Dhofar, Muscat and Musandam. The governorate of Muscat is the largest city in Oman and the only metropolis in the country. These 11 regions are further divided into 61 districts (wilayat). Each of the 61 districts is headed by a district governor (Stannard, 2006). The Governorate of Muscat, which consists of six districts namely, Muscat, Mutrah, Seeb, Bausher, Al Amerat and Quriyat, is Oman’s most densely populated region (Kechichian, 1996). There is no political party in Oman and elections of non-partisans are held for the parliament (Majlis Al-Shura).

The political context of Oman has played a crucial role in the rapid growth and development of the country since 1970 (Common, 2011). The Council of Oman (Majlis Oman) follows a bicameral system with two chambers comprising of the Consultative Council (Majlis al-Shura), also referred to as the parliament, and the State Council (Majlis al Dawla) (Walsh and Darke, 2016). A bicameral system is a legislative system whereby the functions are divided between two chambers. The members of the Consultative Council are elected for terms of three years. The Consultative Council is made up of 83 elected members representing the 61 districts of the country. The elected candidates are those who obtain the highest number of votes according to the official election results. The Consultative Council is mainly responsible for economic and social issues. Although the Consultative Council has a role in proposing legislation and expressing views on laws passed about the economy, health, education and the environment, it does not have binding legislative powers (International Business Publications, 2009). The members of the State Council are directly appointed by the Sultan (Walsh and Darke, 2016; Darke, 2013) and
are selected based on their experience, expertise and reputation (Walsh and Darke, 2016). There are 53 members of the State Council and they are appointed for a three year renewable term (Darke, 2010). The State Council plays a vital role in the development of the country because it has the power to review and revise draft laws, and submit proposals to the Council of Ministers and the Sultan (Chow, 2009; Darke, 2010).

Governance in Oman is in the form of exclusionary politics derived from different clans or tribes and is described as clan-based system (Lucas, 2004). The exclusionary politics refers to the involvement and assembling of a mainstream of 'citizens' who perceive themselves as national hosts (Anderson and Taylor, 2002). The government institutions in the country are mainly populated by the ruling family, which in turn contributes to a stable regime in the country. However, the high representation of the ruling family in these institutions means that they have the opportunity to pursue their personal aims and agendas (Brownlee, 2002). The Sultanate of Oman does not have a constitution, and the press and media are completely controlled by the government (Douai and Moussa, 2016).

4.2.3 Economic Structure

The economy of Oman has been dramatically improving ever since the Sultan took power in July 1970 (Russell, 2015). Since then, Oman has been undergoing modernisation with the building of new roads, buildings, ports and businesses (King, 2009). This strategy focused on development by supporting companies in increasing their production in areas including agriculture, mining and fisheries leading to the exports in Oman outnumbering imports for five consecutive years to 2013 (Oxford Business Group, 2016). Oman’s population and economy grew by 53% from 2009 to 2011 which resulted in increased demand for electricity and other energy resources (Oxford Business Group, 2013). The
Oman economy is mainly driven by the public sector (Common, 2011). The public sector in Oman is one of the largest employers for Omanis (IBP, 2015). Services, manufacturing and construction industries are the next highest provider of employment to the people of Oman (Budhwar and Mellahi, 2016). The continuous modernisation of the Oman economy has led to the overall development of the economy, which in turn has led to increased demand for well-educated and experienced professionals, prompting the government to train more people to meet that demand (King, 2009). Increasing employment opportunities for nationals is the objective of many oil exporting countries including Oman, and the public sector accounts for 40 to 45% of new job creation in Oman (World Bank, 2004).

Oman is recognised as a country with high statutory control (Askary, 2006), and the government’s intention to increase the manual labour force in its government institutions decreases the need for technology in these institutions. The fact that the public sector is the largest provider of employment in Oman increases the chance of corruption in the country (Habeeb, 2012). Currently, the Sultanate is focused on eradicating this risk from society. One means of achieving this is through increasing the salary and benefits of public sector employees so that there is less motivation to engage in corruption (Habeeb, 2012). Another method is through severe punishments for corruption including fines and lengthy prison terms. The year 2014 saw a sudden surge in the level of criminal prosecutions of senior executives and government officials in Oman for corruption. The senior government officials involved in this corruption were punished severely resulting in imprisonment, and thereafter, regulations were strengthened to ensure strong internal auditing controls in both the public and private sectors. The financial statements and accounts of private and public sector organisations in Oman are subjected to auditing and certification procedures akin to those in other countries. The foundation of the Oman
economy is oil. However, agriculture, fishing and tourism now represent important revenue generating streams for the country (Oxford Business Group, 2016) as Oman endeavours to reduce its oil reliance. The finite nature of crude oil, and the price fluctuations associated with it, have resulted in calls for the diversification of Oman’s revenue generating sectors (Alsharif, Bhattacharyya and Intartaglia, 2016). To reduce Oman’s dependence on the oil industry, the focus of the economy is now moving towards trade and tourism, construction and real estate, and manufacturing and building (Ashrafi & Murtaza, 2008). To this end, its economic investments include investments in infrastructure, social programmes and small business development (Banks, Overstreet and Muller, 2008). Although the dependency on oil and gas revenues has substantially reduced over the decades, these still account for the largest income source for the Oman economy. At present 85% of government revenue in Oman is obtained from the oil and gas sectors. However, this is expected to be reduced by more than 15% by 2020. Currently, 35% of Oman’s gross domestic product (GDP) is provided by the oil and gas industry (IBP, 2013). This is expected to be reduced to 19% by 2020 through diversifying the economy.

The port of Muscat is the largest port of the country, sometimes referred to as the ‘seat of the Sultanate’. Muscat is growing in stature as a regional and international economic centre. Muscat International Airport and sea ports such as Port Sultan Qaboos and Mina al Fahal provide the main links between Oman and the outside world, along with a modern system of road and telecommunication networks. Muscat International Airport also provides regular access to Salalah, and the smaller regional airports within Oman. Muscat has classic five-star hotels such as the Intercontinental Muscat which provides visitors with exemplary catering services. Additionally, the high speed fibre Internet connectivity allows for seamless business communication.
4.2.4 National Culture and Organisational Power Structures of Oman

Culture is identified to have one of the most influential roles in the way in which the audit function operates (Abdolmohammadi & Sarens, 2011; Abdolmohammadi & Tucker, 2002; Hell & Wang, 2009). The culture of a nation is determined by five cultural dimensions as defined by Hofstede (2001). These are power distance, individualism versus collectivism, uncertainty avoidance, masculinity versus femininity and time orientation. According to Alzeban (2015), the three cultural dimensions that have a direct impact on the internal audit quality are power distance, uncertainty avoidance and individualism versus collectivism.

The Arab countries that were included in the study performed by Hofstede and Hofstede (2005) include Egypt, the Lebanon, Saudi Arabia, the United Arab Emirates, Iraq and Kuwait all of which have high power distance and high uncertainty avoidance. Although Oman is not one of the countries studied by Hofstede 1980, the national culture of Oman, is assumed to be similar to the neighbouring Arab countries. The major characteristics of the national culture of Oman is the high level of power distance in the organisations. Power distance is defined by Hofstede (2001, p.98) as “the extent to which the less powerful members of institutions and organisations within a country expect and accept that power is distributed unequally”. The members of a high power distance culture expect and accept unequal power in an organisation (Lenzner, 2006). Arab countries have high power distance due to the hierarchal organisational structures where the superior are considered to be more powerful than the subordinates (Al Obaidani, 2014; Branine 2011). The study conducted by Alzeban (2015) in Saudi Arabia found that companies with high power distances are characterised by lower internal audit quality. Although there is no power
distance scoring for Oman, the scores of the Arab countries and the inequality in the power and wealth in society suggests that Oman represents a high power distance nation.

The centralisation of the power in the monarch, the authoritative structure and the subordinate’s acceptance of the hierarchical structure reinforces high power distance in Oman (Common, 2011). According to Combe (2014), the public sector organisations in Oman follow a hierarchical organisational structure with executive level and operational level staff. The key decisions and strategic decision making and policy making is retained by the executives which is indicative of the power distance in the country. The high level of power distance in Arab countries means that the hierarchical system in Arab society is functional and accepted, and some people have higher status than others (Alzeban, 2015). According to Common (2011), leadership authority is associated with group affiliation and the high power distance in organisations is reinforced through obedience to the senior and loyalty to the society.

Uncertainty avoidance refers to the extent to which the organisational members depend on and revert to the social norms, beliefs, rituals and practices to reduce the unpredictability of events that can happen in the future (Alzeban, 2015). Since the score for cultural dimension of Oman is not measured, the score of neighbouring countries that share similar practices is used. Saudi Arabia ranked 68 for Hofstede’s 1980 uncertainty avoidance which indicates that Arab countries are not very tolerant of uncertainty. The strict regulatory systems characteristic of Arab countries is evidence of their intolerance for uncertainty (Cassell and Blake, 2011). Uncertainty avoidance concerns avoiding ambiguity and uncomfortable situations (Abdulhadi, Al Shafaee, Freudenthal, Östenson and Wahlström, 2007). According to Hofstede (2001), some examples of high uncertainty
avoidance in a society include the operation of a rigid rule system, stability of careers, acceptance of absolute truths and rejecting deviant behaviour and ideas.

Individualism is the extent to which individuals are concerned with their own wellbeing rather than the wellbeing of others. In contrast, collectivism refers to the degree to which individuals perceive themselves as being part of a group and gives priority to group ahead of individual needs (Alzeban, 2015). According to Alzeban (2015), individualism positively influences the quality of the internal audit function as individuals are focused on improving their professional practice and enhancing their individual accomplishments. In a collectivist organisation the motives of personnel are based on the group aims and objectives. Arab countries have very low individualism scores which indicate that the Arab society are collectivist in nature (Cassell and Blake, 2011). The main features of a collectivist organisation centres on the use of teams, a high level of loyalty of employees towards the organisation, and the sharing of reward and praise (Hofstede, 2001).

A highly professional internal audit practice is mainly found in countries with low levels of uncertainty avoidance, power distances and collectivism (Alzeban, 2015). Higher scores for uncertainty avoidance, collectivism and power distance in Arab countries would be associated with internal audit functions that lack uniform internal audit practices and demonstrate low levels of professionalism among internal auditors (Alzeban, 2015). This is because in high power distances cultures, the concentration of power in few hands can result in management overriding controls and staff recruitment based upon personal preferences ahead of competence, thereby adversely affecting audit quality. A high uncertainty avoidance environment is typically associated with less accurate audits as the internal audit procedures vary at a local level and rigid rules are not applicable (Hell and
With high individualism the individual behaves in their own interest and work towards their own personal achievements rather than the collective goals in a collectivist community (Hofstede, 2001). The organisational culture of Oman is significantly influenced by its national culture. According to Alzeban (2015), national culture has a strong influence over the national auditing environments in Arabic countries. Organisational culture refers to the way in which the organisation works and the way the people in the organisation think and act (Maull, Brown and Cliffe, 2001). Schein (1984, P. 3) defined organisation culture as:

The pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaption and internal integration, and that have worked well enough to be considered valid, and, therefore to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (P. 3)

Organisation structure refers to the way in which the institution organises its work. This includes the formal hierarchy and informal structures and networks that mainly reflects the power structure of the organisation (Kemp and Dwyer, 2001). The employees in the organisation are taught to behave in a certain way for the survival and growth of the organisation (Maull et al., 2001). Johnson and Scholes (1997) identified six types of artefact of organisational culture. These are rituals and routines, stories, symbols, power structures, organisational structures and control systems. Organisational structure and power structure are two key elements of organisation culture (Kemp and Dwyer, 2001). Power structures are associated with the managerial groupings of the organisation that influence the formulation of core beliefs. According to Butler and Rose (2011), an organisational power structure refers to legitimising the dominance and subordination in
an organisation. The subordinates in the organisation need to comply with the policies and rules and regulations set by the superiors, and be held answerable to the superiors (Butler and Rose, 2011). All the public institutions in Oman follow a formal hierarchy which reflects the power structure of the country. The formal hierarchy in Oman operates in such a way that there is a supreme authority, managerial authority and the employees. The power structure and organisational structure of the SAI, the RAO and the RCA are discussed next.

4.2.5 International Affairs

Oman is an active member of the United Nations (UN), the International Monetary Fund (IMF), the World Bank, and the World Trade Organisation (WTO) (Walker and Butler, 2010). It is also part of the Gulf Cooperation Council (GCC) and is considered an upper-middle income economy by the World Bank (World Bank, 2012). The GCC countries including Oman, have been experiencing enormous economic growth due to their oil resources (IMF, 2014). This in turn has led to favourable infrastructure development and expansion of public goods provision (Al-Lamki, 2000). The availability of hydrocarbon resources, especially crude oil, has ensured the strong fiscal position of the Sultanate of Oman for the last four decades (gulfbase.com, 2015). The collaborative approach of the GCC states create the opportunity for the exchange of ideas and the transfer knowledge and best practice in a variety of areas, including developing and institutionalising a culture of anti-corruption within the public sector. Oman collaborates with other GCC member states such as Qatar and the United Arab Emirates (UAE) to develop best practice in anti-corruption (Zhang & Lavena, 2015). Currently, Oman is a member of more than 105 international organisations, and maintains diplomatic relations with over 140 countries. The central principle of Oman’s foreign relations is non-interference and neutrality. Peace,
harmony and close cooperation with all nations are the guiding forces of Oman’s foreign policies (Oxford Business Group, 2013). In addition, as a member of the GCC, Oman has also developed strong ties with neighbouring countries including India, Pakistan, and many African countries (Oxford Business Group, 2010). With the aim of fostering stronger ties with these countries, Oman is currently developing its main ports including Salalah, Duqm and Sohar (Oxford Business Group, 2016). The strategic location of Oman makes it the gateway of Arabia to South Asia. The next section discusses accounting and financial reporting in the context of Oman.

4.2.6 Government Accounting and Financial Reporting

Government accounting refers to the practice of recording, summarising, analysing and interpreting information regarding the revenue generated by the government, and expenditure of public funds (Adediji, 2013). The financial reports of the government are prepared based on all material facts relating to the financial position and operations of the government (Achua, 2009). The Central Bank of Oman is responsible for the monetary and financial stability of the country and its economic growth (Central Bank of Oman, 2016) Audit of government financial reports is part of the government’s financial policy (Onuorah & Appah, 2012). Public finance management (PFM) is a major component of government accounting, as the aim of PFM is to efficiently apply public money to achieve long term sustainable development (Beschel and Ahern, 2012). According to Cangiano, Cirristine and Lazare (2013), PFM is an interdisciplinary combination of accounting, economics, political science, and public administration, which focuses on the effective utilisation of public money through budgeting.
Public finance management in Oman is measured using the Public Expenditure and Financial Accountability (PEFA) Framework (Beschel and Ahern, 2012). An evaluation of public finance management in the Middle East and North Africa (MENA) region of Oman using the PEFA Framework identified four dimensions that are strong, and four which are weak. The main areas of strength are credibility of budget, comprehensiveness and transparency, policy based budgeting, and transparency of taxpayer obligations and liabilities. In terms of weaknesses, the internal audit of public finance in the MENA region was ranked consistently poor. In particular, internal audit was considered weak in the areas of value for money, controls in procurement, and competition (Beschel and Ahern, 2012). Beschel and Ahern (2012) examined the status of accounting, recording and reporting of the PFM system of countries in the MENA region and found that the accounting, recording and reporting performance in the MENA region is slightly better than the global averages. The study also found that when compared to the global averages, the MENA region ranked consistently lower for the quality and timeliness of annual financial statements and effectiveness of internal audit. The third area of weakness in public finance management was the credibility and authenticity of external audits. The fourth and final area of weakness related to the external audit body and the legislative body responsible for follow up (Beschel and Ahern, 2012). The next section examines the regulatory environment of Oman.

4.3 Regulatory Environment

Oman has a well-developed regulatory framework on auditing which provides guidelines for companies operating in the country to promote sound financial management. The audit laws focus on financial reporting, corporate governance and transparency in financial management. The main rules and regulations that govern auditing and corporate
governance practices specific to the Sultanate of Oman include the State Audit Law (2011) and The Law Organising the Accounting and Auditing Profession (1996). In addition, the country has several institutions that oversee the implementation of audit guidelines such as the State Audit Institution (SAI).

4.3.1 State Audit Law (2011)

The first State Audit Law in Oman was issued in 1985. This introduced major changes to the state audit function which was formed prior to 1970 (International Business Publication, 2010). The first state audit mandate was established by Royal Decree No. 36/85 (International Business Publications, 2010). This law was then updated several times thereafter to enhance the audit function and deliver continuous improvements (Asian Organisation for Supreme Audit Institutions, 2002). All audit laws and legislative regulations in Oman are passed by a Royal Decree. A Royal Decree is an authoritative order passed by the Sultan. Drafts for Royal Decrees are prepared by the ministry of legal affairs which works in conjunction with the relevant ministries and government units affected by the laws and legislative regulations (mola.gov.om, 2013).

All rules, regulations, systems, institutions and institutional audit operations are documented in the State Audit Law. The State Audit Law is committed to ensuring high quality audits in Oman by giving the State Audit Institution (SAI) sufficient freedom and flexibility to perform its primary functions of protecting public funds and interests. The State Audit Law has a well-structured format, clearly stating the duties and prerogatives of the State Audit Institution (SAI) in carrying out audits, and other important matters necessary to exercise the powers of the SAI. The expanded powers of the SAI under the State Audit Law have resulted in the identification of many financial irregularities and
instances of misuse of power by ministers. The most recent State Audit Law (2011) was issued by Royal Decree No. 111/2011 (SAI, 2011). The State Audit Law 2000 issued through Royal Decree No. 55/2000 strengthened the independence of State Audit Institution and expanded their audit mandate to cover government owned companies and other entities (IAACA, 2012). With the issuance of the State Audit Law 2011 (Royal Decree No. 111/2011), Royal Decree No. 55/2000 and any provisions of that decree that contradict the State Audit Law (2011) are repealed (SAI, 2011).

As per Article (4) of State Audit Law (2011), the State Audit Institution is entitled to carry out the financial and administrative audit of any funds owned, managed, or supervised by the state of Oman. Article (10) of the State Audit Law (2011) identifies the entities subject to an audit by the State Audit Institution. These include (1) public authorities, establishments and other autonomous legal entities, (2) companies fully owned by the government or with a collective or exclusive government shareholding of more than 40%, (3) companies that are granted a concession to exploit a natural resources of public utility, (4) investment, pension and any other governmental funds, (5) private funds managed or supervised by any of the entities subject to an audit by the State Audit Institution, and (6), entities which are not subject to an audit by the State Audit Institution but are audited upon their request, or if the SAI determines that the public interest necessitates an audit of that entity (State Audit Law 2011). The audit of state-owned entities is subject to the State Audit Law (2011). The State Audit Law (2011) provides the State Audit Institution with the capacity of an autonomous legal entity and sets the main objectives of the State Audit Institution. The main responsibilities of the State Audit Institution as prescribed by the State Audit Law (2011) include, (1) performing internal and external audits of state public funds and private funds managed or supervised by the state, (2), providing assurance on
the efficacy of internal controls and audit systems, (3), providing assurance on the appropriateness of the financial and administrative decisions taken by these entities, (4), providing assurance on compliance with laws and regulations, (5), performing preventative audits, (6), evaluating the performance of entities to ensure that the resources are utilised with economy, efficiency and effectiveness, and (7), detecting reasons for deficient performance (SAI, 2011).

As per Article (10) of the State Audit Law (2011), auditors of the State Audit Institution have the right to review documents, records, accounts and supporting information, and any other relevant digital data necessary for the proper and complete discharge of their duties. The auditors of the State Audit Institution can retain documents obtained until the audit and review are completed (SAI, 2011). The audit report from the audit of the draft final accounts of the State Audit Institution are reported to the Ministry of Finance to carry out any corrective action (SAI, 2011). The audit report is then referred to the Council of Financial Affairs and Energy Resources after corrective action has been implemented (SAI, 2011).

4.3.2 The Law Organising the Accountancy and Auditing Profession (1996)

Royal Decree No. 53/1996 is the law that currently regulates the profession of accounting and auditing in Oman (Vinten & Al-Qahtani, 2005). As per the Law Organising the Accountancy and Auditing Profession (1996), it is mandatory for companies and public entities in Oman to prepare financial statements in accordance with International Financial Reporting Standards (IFRS) (Vinten & Al-Qahtani, 2005). Companies in this regard refers to all domestic companies including those whose securities are traded on a public market, and those whose securities are not traded on a public market. The mandatory preparation
of financial statements in line with IFRS is part of the country's commitment to move towards a single set of high quality accounting standards. This law sets the minimum requirements and qualifications necessary to practise accounting and auditing in Oman, thus helping to ensure that audits conducted in the country are of a satisfactory standard.

The profession of accountancy and auditing can only be practised in Oman after obtaining a licence from the Ministry of Commerce and Industry. To gain admittance to the profession, certain conditions must be fulfilled. These are; (1), the person should be an Omani national who is wholly dedicated to practising professionally, (2), the person should have a university qualification in accountancy, or possess a chartered accountant certificate acknowledged internationally, or its equivalent, such as the Certified Public Accountant (CPA) or Association of Chartered Certified Accountants (ACCA) designations, (3), the person should have a good reputation and be of good character, (4), the person should be of full capacity, and finally (5), the person should not have been convicted either judicially or administratively of a felony or a dishonourable crime. The next section presents an overview of the three public audit institutions in Oman that govern the audit of state and federal organisations in the country.

4.4 Audit Institutions in Oman

The three main public institutions in Oman which play a significant role in auditing public organisations are the State Audit Institution (SAI), the Royal Court Affairs (RCA) and the audit department of the Royal Army of Oman (RAO). The State Audit Institution is responsible for the financial and administrative audit of federal organisations in Oman. The aim of this organisation is to protect state funds and identify financial irregularities (SAI, 2002). The Royal Court Affairs forms a major part of Oman’s governing system
and has an independent audit department. The audit department in the Royal Army of Oman (RAO) is responsible for the independent appraisal of the royal army. These organisations represent three important branches of the government and are independent of one another. Since these organisations are an integral part of the security and governance in Oman, it is important to examine the audit functions within each of them.

4.4.1 State Audit Institution (SAI)

The State Audit Institution (SAI) was established in 1976 as an independent body to safeguard government assets and to investigate financial irregularities in state and federal organisations in Oman (The National Staff, 2013). The audit function of the SAI is intended to evaluate the performance of state and federal organisations, provide assurance on their internal control systems, and assess compliance with applicable laws and regulations (Varghese et al., 2016). It also endeavours to highlight deficiencies in financial laws, rules and regulations, and to recommend a means of rectifying such deficiencies (SAI, 2002). The SAI has the power to take actions including suspending staff, and recovering funds used illegally when a financial and administrative irregularity is identified (The National Staff, 2013). In addition to auditing the accounts and the financial aspects of personnel related decisions, the State Audit Law (2011) requires the SAI to perform tasks such as monitoring the implementation and progress of projects falling within the development plan, to ensure that financial allocations are properly used (SAI, 2002). The SAI is the supreme external audit institution in Oman as it conducts audits of state and federal organisations (Organisation for Economic Cooperation and Development (OECD), 2012). There is a hierarchical structure for the state audit institution. Heading up the SAI is a president and deputy president. The president and deputy president are supported by an assistant deputy president, advisors, directors general and directors (State
Audit Institution, nd). There is high power distance in the SAI as the authority is centralised at one point, and there in unequal distribution of abilities, capabilities and skills of the members of the SAI (Al Obaidani, 2014). The subordinates of the SAI are answerable to the superiors and the subordinates accept the power of the superiors which is indicative of a high power distance culture.

Audit reports are usually issued by the SAI after every audit to the Ministry concerned. The results of the SAI's work throughout the year is also summarised in an annual report which is submitted to His Majesty, the Sultan (SAI, 2002). In 1999, almost 150 agencies were audited by the State Audit Institution (SAI, 2002). The SAI continues to pursue improvements with the aim of enhancing the effectiveness of its function. It plays a major role in the modernisation and development of audit techniques used in the country (SAI, 2002). His Majesty, the Sultan, recognises the importance of audit work and therefore continuously identifies areas for improvement (SAI, 2002). The State Audit Institution currently consists of 172 staff, predominantly graduates, in areas such as accounting, finance and law. Figure 4.2 shows the structure of the State Audit Institution.
4.4.2 The Royal Court Affairs (RCA)

The Royal Court Affairs (RCA) is a private governmental agency in Oman. It is an independent entity established in 1980, primarily to serve His Majesty, Sultan Qaboos bin Said al Said. The RCA is a hierarchical organisation which is headed by the Minister of the RCA, and has 21 Directorates. There are approximately 21,000 employees working across these 21 Directorates. The structure and functions of the Royal Court Affairs reflects the national culture which includes the high power distance and high uncertainty avoidance. The formal hierarchical structure of the Royal Court Affairs (RCA) is representative of its high power distance culture (Al Obaidani, 2014). According to Combe (2014), the organisation structure of the RCA with 21 directorates facilitates the
coordination of the different functions under the supervision and direction of the RCA. The Directorate General of Audit is one of the 21 Directorates. This particular position was established to give reasonable assurance that the administrative and financial functions and operations of the Royal Court Affairs complied with its rules and procedures. Following strict rules and procedures is part of the high uncertainty avoidance which is prevalent in Arabic countries (Hell and Wang 2009). The Directorate uses the annual audit plan to perform its oversight role and offer technical support to all Directorates.

4.4.2.1 The Directorate General of Audit

The Directorate General of Audit is an individual who has full oversight, and upholds the standards of the Institute of Internal Auditors (IIA). The Directorate General of Audit ensures there are sufficient internal control procedures in place. The Directorate approves the annual audit plan from the RCA Minister thereby ensuring that the audit plan meets the needs of the economy (Ali et al., 2015). The Directorate adopts a proactive approach in performing its duties.

4.4.2.2 Audit Managers and Internal Auditors

Internal auditors working in the RCA monitor and evaluate factors including how well risks are managed, how business is governed, and whether internal processes are operating effectively (Lipman and Lipman, 2006). They also provide a consulting service, advising management on how to improve systems and processes. The scope and nature of audits can vary significantly in the RCA but the main priority of the work is to ensure that any issues that impact the survival and prosperity of the department are addressed. The Government Internal Audit Standards (GIAS) code of conduct for internal auditors establishes important personal characteristics and ethical principles for internal auditors to
demonstrate (Kagermann et al., 2007). The personal characteristics prescribed for internal auditors by the GIAS code include integrity, trustworthiness, attention to detail, sense of responsibility, and reliability (Kagermann et al., 2007). The GIAS code’s ethical principles are independence, objectivity, fairness, discretion and confidentiality, social acceptability, authority and diligence (Kagermann et al., 2007).

Responsibilities of audit managers and internal auditors include establishing policies and procedures to guide internal audit activity, sharing information, and co-ordinating activities with other internal and external auditors (Whittington, 2015). Audit managers must co-ordinate with other Directorates such as the Directorate of Human Resources regarding engagement results and findings. Typically audit managers do not visit the organisation but run audits from their offices, whereas internal auditors engage directly with the organisations to be audited. Figure 4.3 shows the organisation chart of the Royal Court Affairs and the departments and offices under the Secretary General of the Royal Court Affairs.
The next section examines in detail the role and responsibilities of the audit department in the Royal Army of Oman (RAO).

4.4.3 The Royal Army of Oman’s Audit Department

The audit department of the Royal Army of Oman (RAO) is an independent appraisal function within the Royal Army. Its objective is to provide assurance and consulting services designed to add value and improve the organisation's operations. It is a control function that measures, evaluates and reports on the effectiveness of specific areas, such as departments, divisions, and product lines in the Royal Army. Management of this audit department have a duty to establish internal controls so that its activities are conducted in
an efficient and proper manner. The audit department of the Royal Army is managed by the Chief Auditor or the Head of Internal Audit, whatever name is chosen. Employees respect for the work place, following the formal lines of communication and awareness about the pyramidal structure of the organisation are evidence of the high power distance in the country (Alzeban, 2015). The Head of Internal Audit must seek approval for the yearly audit plan from the commander of the army. This approval must take the form of a written document which must also define the purpose, authority, and need for an internal audit (IIA, 2017). For example, in private sector companies it is common for the internal audit department to report to the audit committee or to the board of directors, whereas, in the ministries, the internal audit function commonly reports directly to the minister’s office (Riphenburg, 1998). Other audit roles occupied within this department include the deputy chief, senior auditors, auditors and assistant internal auditors. Training is important for the successful performance of the internal audit department. Typically, this takes the form of in-house training, external workshops and professional accountancy courses. The next section examines the influence of ethics in the public administration.

4.4 Ethics in Public Administration

Ethics is integral to the discussion of a modern public administration especially due to the fact that political pressure is regularly used to bend ethical rules (Vigoda-Gadot, 2007). The negative impact of corruption and unethical behaviour on public organisations and public service are pervasive (Luk, 2012). The problems associated with corruption, abuse of power and fraud persevere, leading to reduced public confidence. Luk (2012) notes that unethical behaviour has the potential to destroy public trust in the government and undermine the foundations of democracy. This is especially true in public administration where unethical behaviour affects fairness in awarding government tenders and in terms
of resource allocation (Vigoda-Gadot, 2007). In Oman, parastatal heads are usually political appointees, hence eroding public confidence in these institutions (Stivers, 2001). When the public administration promotes the interests of powerful individuals and engages in unfair practices which favour the powerful and wealthy, the public administration is perceived as unethical, resulting in a loss of trust in the government (Van Ryzin et al., 2004).

There is a movement towards strengthening and modernising the public administration in Oman through fair and ethical services which should create a positive image for the state services (Hallunovi, Osmani and Bashi, 2014). Ethics embodies standards, morals, knowing the difference between right and wrong, and values such as honesty and integrity (Beeri, Dayan, Vigoda-Gadot, & Werner, 2013). Several governments worldwide such as in Britain and the US are currently embracing ethics in their reform agendas (Luk, 2012). According to Vigoda-Gadot (2007), the success of public sector reforms depends on values, ethics, and mutual trust between public institutions and ordinary citizens. Because the state makes choices on behalf of voters, it is vital that these choices uphold the public interest (Luk, 2012).

Championing ethics in the public administration is an effective way of reducing problems including corruption and theft (Hallunovi et al., 2014). An ethical approach to public administration requires public personnel and administrators to perform their duties with the objective of promoting public welfare. An ethical public administration ensures transparency of information; promotes the public interest and economic development; respects democratic and procedural processes; and exercise public accountability. The attitude and satisfaction with the public administration system depends on ethical
considerations and decisions taken by the government and public administration (Webler and Tuler, 2000).

Ethics may be thought of as a type of self-accountability (Peloza, White, & Jingzhi, 2013). It is measured by the level of integrity demonstrated by the public personnel of a country (Vigoda-Gadot, 2007). According to Luk (2012), ethics is of paramount importance in government organisations given that public directors are essentially guardians of the state. As a result, public directors must observe even higher ethical standards than those demonstrated by workers within the private sector (Comite, 2011). For instance, the Sultanate of Oman has ethical guidelines based on accountability and quality of service, and all public servants are expected to abide by them. To safeguard the integrity of employees an ethical culture must be cultivated within the organisation. This is why the Omani Government established the Omani Corruption Report Portal in 2013 to root out corruption in the public sector. However, the implementation and institutionalisation of ethics in government is not an easy matter (Comite, 2011). Maintaining a deep-rooted long term culture of integrity and high moral standards is a task that perpetually requires new initiatives. This is the reason why the Sultanate of Oman is committed to digitising government services as such measures help to reduce corruption.

### 4.5 Conclusion

The institutional context of Oman is a product of its history, regulatory environment, audit institutions of the country and ethics in its system of public administration. This chapter provided an introduction to Oman, as well as details concerning its geographic distribution, political and administrative structures, economic structures, international affairs and system of government accounting. The main feature of Oman’s political and
administrative structure is the supremacy of Sultan Qaboos, and his decision-making role. A bicameral legislative system with the consultative and state councils is a key feature of the legislative system in Oman.

The economy of Oman is undergoing rapid development with growth in the oil and gas sectors, and increasing job opportunities in the country’s public service. Currently, the economy is in the process of diversifying to other areas. As part of this economic development Oman is building its international relationships and participating in more international organisations. An evaluation of the public accounting and financial reporting system reveals that internal auditing is an area in need of improvement in the MENA region of the country.

The State Audit Law (2011) and The Law Organising the Accountancy and Auditing Profession (1996) govern internal auditors. The main audit institutions that perform internal auditing of public organisations in Oman include the State Audit Institution, the Royal Court Affairs and the Royal Army of Oman’s audit department. Another major consideration in the internal audit domain pertains to the regard for ethics in public administration. Public administration is constantly exposed to corruption, abuse of power and fraud, all of which adversely affect public confidence. This study is conducted in Oman and focuses on CAAT adoption intention among internal auditors in the public organisations of Oman.
5. **Research Methodology Phase 1: An Exploratory Approach**

5.1 **Introduction**

The varying effectiveness of existing technology adoption models in explaining the underlying factors that influence technology adoption highlights a need to develop a technology adoption intention model specific to the internal audit context (Samaradiwakara and Gunawardena 2014, Venkatesh et al. 2003, Williams, Rana and Dwivedi 2015). Researchers who examine technology adoption continue to use different combinations of technology acceptance theories in the absence of a single theory capable of explaining the factors that have a significant bearing on technology adoption (Williams et al., 2015). The theory of reasoned action (TRA), the technology acceptance model (TAM), and the unified theory of acceptance and use of technology (UTAUT) are the most common theories of acceptance applied by researchers (Williams et al. 2015).

The conceptual model for this research is based on the TRA, the TOE, the TAM, and the UTAUT. Two areas of the literature, namely the diffusion and adoption of information technology (IT), and the factors influencing user acceptance of technology are used in the development of this conceptual model. This chapter is divided into four main sections. The first section introduces the research question. The second section details the research objectives. The third section sets out the research design employed for this research, and the fourth section explains the research method adopted, and the outcomes of Phase 1 of this study.

5.2 **Research Question**

The research problems at the heart of this study are to develop a model that predicts intention to adopt CAATs in an internal audit context, and to identify the effects of the
elements that drive audit technology adoption intention on the internal auditor’s perception of audit quality. To address these research problems, this study is conducted in the context of the internal audit institutions in the Sultanate of Oman. According to Bryman (2007), a research question is designed to define the research problem, and to serve as a guide to solving that research problem. Accordingly, the research question that is used to solve the research problem in this study is as follows:

5.2.1 Research Question
What are the major elements that influence the technology adoption intention of internal auditors of public internal audit organisations in Oman, and how do the elements that influence the audit technology adoption intention influence their perception about audit quality?

5.3 Research Objectives
The research objectives break down the research question and specifically identify the goals underlying each research objective. The aim of this research is to assess the factors that have a significant influence on the internal auditor’s intention to adopt technology in the context of government internal audit in Oman. The three objectives and associated sub-objectives of this study are thus as follows:

5.3.1 Objective 1
Objective one is to develop a conceptual framework to measure the internal auditor’s intention to adopt CAATs. With advances in technology, adoption of information technology for internal auditing has become widely feasible and widely promoted by academics and practitioners alike (Gonzalez, Sharma and Galletta 2012). Several studies
have identified the importance of technology adoption in an internal audit context in ensuring compliance with laws and regulations, and in maintaining high-quality, decision-relevant information (Vasarhelyi et al. 2012). However, actual adoption of information technology for internal auditing remains significantly low (Chan and Vasarhelyi 2011, Gonzalez et al. 2012). A study conducted by Deloitte (2010) found that adoption of information technology for internal auditing is hindered by a variety of barriers such as a lack of clarity concerning the perceived benefits, insufficient resources and funds for implementation, and poor technology readiness.

Examining the factors hindering technology adoption in an internal audit context is crucial to enabling its effective implementation and utilisation. Most of the studies which examine the internal auditor’s intention to adopt technology are based on behavioural intention theories of technology adoption such as the theory of reasoned action (TRA), the technology acceptance model (TAM), and the unified theory of acceptance and use of technology (UTAUT) (Gonzalez et al. 2012). The main factors these studies have identified as influencing the behaviour of auditors are the perceived costs (Vasarhelyi et al. 2012), perceived benefits (Braun and Davis 2003, Moorthy et al. 2011), performance expectancy (Ahmi, Saidin and Abdullah 2014, Gonzalez et al. 2012), effort expectancy (Gonzalez et al. 2012, Vasarhelyi et al. 2012), social influence (Gonzalez et al. 2012), facilitating conditions (Gonzalez et al. 2012), and perceived usefulness (Davis, Bagozzi and Warshaw 1989, Kim, Mannino and Nieschwietz 2009, Sun 2012). However, the existing models fail to recognise the influence of factors such as top management support, technology readiness, and specific internal audit factors including independence and time pressure. Accordingly, there is a need to develop a conceptual framework for technology
adoption in the internal audit context which evaluates the influence of significant factors that affect the behavioural intention of internal auditors to adopt audit technology.

5.3.2 Objective 2

Objective Two is to assess the level of influence of technological, organisational, environmental and individual factors on the intention to adopt CAATs. Identifying the factors that have the highest and lowest level of influence on the internal auditor’s intention to adopt CAATs allows the prioritisation of those factors based on the extent of their influence on effective implementation. Thus, the second objective of this research study is to examine the level of influence of technological, organisational, environmental and individual factors on the technology adoption intention of internal auditors. Sun (2012) notes that prior studies on information technology adoption in the area of internal auditing have focused on splitting up components and that there are no studies that have simultaneously examined how all four factors influence technology adoption intention in an internal audit context. For example, some studies have focused on individual behavioural factors (Davis et al. 1989) whilst others have solely focused on organisational factors (Sun 2012). The purpose of this research objective therefore, is to identify the factors having the highest level of influence on the internal auditor’s intention to adopt CAATs. To more fully understand this objective, each of the four factors and their unique influences is discussed next.

5.3.3 Objective 2.1

Objective 2.1 is to understand the influence of technological factors on the intention to adopt CAATs for internal auditing in the public audit organisations in Oman. The purpose of the first sub-objective of Objective 2 is to understand the influence of technological
benefits and technological risks on the technology adoption intention of internal auditors. The IT Audit Benchmarking Study (2009) commissioned by the Institute of Internal Auditors’ (IIA) and IIA Research Foundation’s (IIARF) Global Audit Information Network (GAIN), found that CAATs are associated with high costs, difficulties in implementation, and low levels of benefits in the short term (Sun 2012).

Perceived risk does not relate to the actual cost of adoption, but instead to the decision maker’s perception of the cost involved (Vasarhelyi et al. 2012). A study conducted by Ahmi et al., (2016) found that although there are several technology benefits associated with technology adoption in internal audit such as opportunities to verify the accuracy of electronic files and to obtain evidence about control effectiveness, actual adoption nonetheless remains low. The results from that study indicate that perceived technology benefits do not necessarily translate into actual technology adoption (Ahmi et al., 2016).

Internal audit planning primarily employs a risk-based approach, and for this reason, the tools and techniques adopted for internal auditing are based on their capacity to reduce internal audit risk and enhance internal audit performance (Deloitte, 2010). The study by Braun and Davis (2003) notes that the usage of CAATs can reduce audit risks. However, internal auditors without proper knowledge or skills in using CAATs for internal auditing are reluctant to adopt IT owing to technology risks such as data loss (Ahmi et al., 2014). Ahmi et al., (2014) argues that adoption of CAATs could reduce internal audit risk via tools and techniques which detect irregularities and misstatements in the financial statements. In the modern business environment where there is an increasing reliance on technology, CAATs for internal auditing can reduce audit risk by facilitating testing of the entire population instead of only samples, thereby verifying the accuracy of the electronic
files, and evaluating fraud risks (Braun and Davis 2003, Janvrin, Lowe and Bierstaker 2008). Thus, this sub-objective is to examine how technology benefits and technology risks affect the internal auditor’s intention to adopt information technology.

5.3.4 Objective 2.2

Objective 2.2 is to understand the influence of organisational factors on the intention to adopt CAATs for internal auditing in the public audit organisations in Oman. This second sub-objective of Objective 2 is to examine the influence of organisational factors on the intention to adopt information technology in the internal audit context. Although organisational factors constitute a major influence on information technology adoption among internal auditors (Sun 2012), existing technology adoption models tend not to include organisational factors as a component which influences technology adoption. Sun (2012) argues that organisational factors influence the learning process and audit implementation. Organisational factors include top management support (Sun 2012, Vasarhelyi et al. 2012) and pressure from management (Razi and Madani 2013). The changing nature of internal auditing renders organisational factors crucial for the effective implementation of information technology for internal auditing purposes (Sun 2012, Vasarhelyi et al. 2012).

The implementation of IT for internal auditing depends on top managements’ understanding of the benefits of IT and how to implement it (Deloitte, 2010). Information technology implementation for internal auditing involves a significant initial investment and major operational changes necessitating the support of top management (Vasarhelyi et al., 2012). Ahmi and Kent (2014) note that a lack of organisational resources and a lack of support from management reduce the likelihood of internal auditors adopting
technology. Studies show that top management play a crucial role in the communication, coordination and execution, and ongoing support required for IT adoption in an internal audit context (Ahmi et al., 2014, Curtis and Payne 2008, Rosli, Yeow and Siew 2012). For this reason, top management support has a strong influence on the internal auditor’s intention to adopt technology (Ahmi et al., 2014, Curtis and Payne 2008, Rosli et al. 2012).

Pressure from management is another organisational variable that has a significant influence on the internal auditor’s intention to adopt technology. Studies show that significant pressure from management can adversely affect the internal auditor’s intention to adopt technology (Griffith, Hammersley and Kadous 2015, Svanberg and Öhman 2013). Pressure from management can take the form of pressure to adopt high audit standards thus placing high expectations on internal auditors. Other common pressures from management include recommendations to omit certain findings, and a reduction in the level of funding allocated to departments in cases where the auditors contravene directions (Svanberg and Öhman 2013).

5.3.5 Objective 2.3
The third sub-objective of Objective 2 is to examine the influence of environmental factors namely, time pressure and audit independence on the internal auditor’s intention to adopt technology. Environmental factors capture dynamics specific to the industry (David, Agboh and Radhakrishnan 2010). In an internal audit context these would include time pressure and audit independence (Hodge, Subramaniam and Stewart 2009). CAATs are regarded as a time saving tool relative to traditional manual audit procedures (Smidt, van der Nest and Lubbe 2014). In a traditional manual audit the internal auditor might perform control tests on just a sample of transactions owing to time constraints. In technology
based internal audits the internal auditor tests all transactions in the population to reach more accurate conclusions (Coderre 2009). Despite the many benefits associated with CAATs such as increased audit efficiency and effectiveness; the time required for data acquisition and data conversion nonetheless represents a barrier to their effective implementation (Lanza 1998).

Internal auditors without proper IT support demonstrate a reluctance to adopt information technology for auditing, as it can adversely affect their ability to adhere to time budgets (Sun 2012). Even so, technology is considered extremely beneficial in that it can facilitate the performance of multiple tasks simultaneously. Moreover, it guarantees accuracy of outputs assuming correct data is input for processing. Furthermore, it performs tasks more efficiently than if executed manually. The capacity of CAATs to allow internal auditors to reach more accurate conclusions is essential for the auditing profession for the maintenance of trust and integrity (Coderre 2009, Smidt et al. 2014). Accordingly, the need for the auditing profession to preserve trust and integrity positively affects their intention to adopt information technology (Moorthy et al. 2011). Internal auditor independence can be strengthened through CAAT adoption as CAATs can be used effectively in fraud detection, and audit planning and reporting, thereby bringing greater credibility to the audit process (Moorthy et al. 2011). A study conducted by Sun (2012) found that most efficient internal auditors use CAATs since it renders them less reliant on management personnel for access to information. However, Sun (2012) notes that when internal auditors are not well trained in CAAT usage, this increases their dependence on IT staff which in turn impairs their efficiency and independence.
5.3.6 Objective 2.4

The last sub-objective of Objective 2 is to examine the influence of individual level factors namely, technology readiness, performance expectancy, effort expectancy, social influence and facilitating conditions on the technology adoption intention of internal auditors. An inadequate level of technology readiness is an obstacle in adopting CAATs (Alles, Kogan and Vasarhelyi 2009, Razi and Madani 2013; Sun 2012). The study conducted by Razi and Madani (2013) found that the technology readiness of organisations represents a major predictor of technology adoption in an internal audit context. Cohen and Bacdayan (1994) note that the level of technology readiness of an organisation can be determined by the nature of their organisational routines. Organisational routines can be either rigid or flexible. In a rigid organisational structure, a single management practice may be applied regardless of the external environment, and all the decisions would be made at the corporate centre (Vallabhaneni 2013). In contrast, for a flexible organisational structure, managers are considered to have sufficient freedom to make individual decisions when required, rather than waiting for a decision from the corporate centre (Botten 2007). In a flexible organisation structure therefore, the levels of technology readiness are higher, as flexible organisations can more easily adapt existing routines, or adopt new routines to facilitate technology adoption (Cohen 1991).

The internal auditor’s perception of the effort required for the adoption of new technology has a significant influence on their intention to adopt that technology (Gonzalez et al., 2012, Curtis and Payne 2014). By the same token, the higher the employee’s perception of the convenience associated with a new technology, the higher the level of adoption will be (Gonzalez et al., 2012, Bierstaker, Janvrin and Lowe 2014). Gonzalez et al., (2012) note that education and training helps to reduce the degree of reluctance stemming from
effort expectancy. The adoption of information technology for internal auditing requires employees to acquire skills and qualifications to effectively use an IT system (Vasarhelyi et al., 2012). Hall and Khan (2003) note that information technology adoption can be slow or less effective if it involves employees acquiring costly skills.

Performance expectancy is the extent to which individuals believe that technology can contribute towards improving job performance (Ghalandari 2012). The study conducted by Ghalandari (2012) identified that performance expectancy has a significant positive influence on the behavioural intention to adopt technology. This means that people are more likely to use technology when they believe that adoption of it will allow them to improve their job performance (Vermaut 2016).

Social influence refers to the internal auditor’s perception of their top executives’ and peers’ attitudes towards technology adoption (Gonzalez et al., 2012). In the internal audit context, group learning, and interaction between the internal audit team members can have a significant bearing on the effective integration of IT into internal auditing (Sun 2012). The study conducted by Gonzalez et al., (2012) found that positive perceptions about peer attitude to technology adoption can positively influence technology adoption.

Finally, facilitating conditions denote the supports available for technology adoption within the organisation including technical and monetary supports (Gonzalez et al. 2012, Janvrin et al., 2008). Janvrin et al., (2008) found that the level of technical infrastructure support is a facilitating condition that positively influences the auditor’s intention to adopt information technology. Similarly, the computer skills of auditors and the CAAT training provided to them can also facilitate technology adoption (Sun 2012). Ramamoorti and Weidenmier (2006) argue that when internal auditors do not have sufficient skills in
technology, they must depend on IT staff to improve their use of CAATs for internal auditing. Thus, facilitating conditions are crucial for the effective implementation of CAATs. Additionally, when the individual perceives that the organisation provides assistance to them to adopt a new technology, this can create positive perceptions on effort expectancy (Gonzalez et al., 2012). Accordingly, an objective of this research is to examine the influence of individual level factors namely performance expectancy, effort expectancy, facilitating conditions and social influence on the internal auditor’s intention to adopt CAATs.

5.3.7 Objective 3

Objective Three is to examine the factors that impact on the perception of internal audit quality in the public audit organisations in Oman. The role of internal audit has become more challenging with increasing demands for high audit quality and timely completion of the audit process, thus necessitating the adoption of IT (Vasarhelyi et al., 2012). The study conducted by Vasarhelyi et al., (2012) found that although there are several obstacles to the complete adoption of IT for internal auditing, there is a progressive acceleration in the direction of technology adoption. Adoption of information technology is acknowledged to improve the internal audit assurance quality because it provides the opportunity to audit 100% of the transactions instead of merely samples, as is the case for traditional audits (Ahmi et al., 2016). One of the frequently cited benefits of using CAATs is the significant improvements they deliver in audit quality and productivity (Mansour 2016, Zhao, Yen and Chang 2004).

Several studies have identified the contribution of organisational factors towards increased audit quality (Arena, Arnaboldi and Azzone., 2006; Arena and Azzone, 2009; DeSimone,
2016; DiMaggio and Powell 1983). The organisational factors that influence both
technology adoption and the internal audit quality are top management support and
pressure from management. DeSimone (2016) examined the factors that contribute to
increased quality in the internal audit context and highlighted the influence of
organisational support in improving internal audit quality. That study found that
management support in the form of direct supervision, training and top management
participation in the area of internal audit have a positive influence on the quality of the
internal audit (DeSimone 2016). Roussy and Brivot (2016) found that the internal audit
can only be of high quality if top management works closely with internal auditors. Top
management support in the form of additional monitoring of the internal audit function can
enhance internal audit quality. According to Slamet (2012), the competence gained with
the provision of training and opportunities for increased education all serve to improve
internal audit quality.

Evidence from previous studies indicate that management can exert pressure on internal
auditors to increase internal audit quality on the basis that improved internal audit quality
can lead to significantly reduced external audit costs (Abbott, Parker, and Peters 2012;
Arena et al., 2006; DiMaggio and Powell 1983). Management pressure can take the form
of management compelling internal auditors to achieve operational goals of the
organisation (Gros, Koch and Wallek, 2017). However, given that such involvement on
the part of internal auditors in operational activities reduces their independence (Roussy
and Brivot, 2016), maintenance of internal audit quality depends on their ability to resist
pressure from management to engage in operational activities (Gros, Koch and Wallek,
2017).
The environmental factors of time pressure and audit independence are acknowledged to influence internal audit quality. A study conducted by Beckmerhagen, Berg, Karapetrovic, and Willborn (2004) found that long term audit plans that are within a specific time frame give a structured and organised approach to the internal audit function which in turn improves the quality of internal audit. Similarly, Arena and Azzone (2009) note that the amount of time internal auditors dedicate to the internal audit function can determine the quality of internal audit. As a result, time, or time pressure, may be a key issue driving audit quality.

The independence of internal auditors is associated with an increase in internal audit quality (Dityatama, 2015; Usman, 2016). A study conducted by Usman (2016) found that increasing the independence of the internal auditor increases the quality of the internal audit. Roussy and Brivot (2016) found that internal auditors must be detached and independent in order to exercise due professional care, and uphold internal audit standards which together contribute towards higher audit quality. Furthermore, organisations that take precautions to protect the independence of the internal auditors are acknowledged to achieve higher internal audit quality (Roussy and Brivot, 2016). Several studies have identified that the lower the independence of the internal audit function the lower will be perceived internal audit quality (Prawitt, Smith and Wood, 2009; Glover, Prawitt and Wood, 2008; Gramling and Myers, 2006). Studies show that outsourcing the internal audit function can contribute towards improved audit quality owing to the relatively higher level of independence of the internal auditors (DeSimone, 2016; Stewart and Subramaniam, 2010). Arena and Azzone (2009) argue that increased independence and autonomy of internal auditors improves internal audit quality as this allows internal auditors to perform internal audit activities in a proper manner.
The increased expectations concerning the quality of internal audit work can influence the technology adoption intention of internal auditors (Mansour 2016). The quality of the internal audit when using CAATs depends on the auditor’s ability to effectively use CAATs (Omonuk and Oni 2015). For this reason, it is necessary to evaluate how CAATs influence internal auditors’ perceptions of internal audit quality in the public organisations in Oman. The study conducted by Omonuk and Oni (2015) in Nigeria, found that there is a positive relationship between CAAT usage and audit quality when the audit firm has effective skills in applying CAATs. In the same study, local firms lacking effective skills in applying CAATs did not achieve high quality audit reports (Omonuk and Oni 2015). Therefore, technology adoption positively influences the quality of the internal audit function. Based on existing research on the factors that influence the quality of the internal audit function, organisational factors including top management support and pressure from management; and environmental factors including time pressure and audit independence all have significant impact on the quality of the internal audit function. Thus, a further objective of this research is to examine the factors underpinning audit quality.

5.4 Research Design

The research design helps to ensure that the research evidence obtained, effectively addresses the research problem. This requires the selection of a suitable research philosophy, research approach, and research methods. Accordingly, the following sub-sections examine the research philosophy employed, the research approach adopted, the research methods used, and discuss how a positivist research philosophy impacted the research design.
5.4.1 Research Philosophy

A positivist research philosophy is defined as a research paradigm that employs empirical methods, makes extensive use of quantititative analysis, or develops logical calculi to build a formal explanatory theory (Creswell et al. 2003). A positivist research philosophy allows the development of definite laws through a highly structured methodology that facilitates replication (Gill et al., 2008). Given that the purpose of this research is to develop a model representing a standardised theory for technology adoption intention in an internal audit context, a positivist research philosophy was considered appropriate. This is because the highly structured methodology of a positivist research philosophy allows one to obtain definite and objective answers about the effects of technological, organisational, environmental and individual factors on the technology adoption intention which can then be generalised to other internal audit contexts. With a positivist approach, human behaviour is considered passive, controlled, and determined by the external environment, and so, knowledge is regarded as objective and quantifiable (Thomas 2010).

In positivism, quantitative methods such as surveys are invariably used to collect data, and relationships between variables are determined using mathematical and statistical calculations (Buddharaksa 2010). According to Wright and Losekoot (2012), positivistic research is objective, quantitative, experimentalist, scientific, and traditional. With a positivist approach, logical reasoning can help in discovering links between simultaneously occurring events (Kaboub 2008). The association and impact of the independent variables of this research namely, technological, organisational, environmental and individual factors on the technology adoption intention of internal auditors can be therefore best understood using a positivist research philosophy. The aim of a positivist approach is to predict the possibility and future direction of the selected object (Buddharaksa 2010). On that basis, it is appropriate in the context of the current...
research study which involves predicting the technology adoption intention of internal auditors based on technological, organisational, environmental and individual factors.

5.4.2 Justification for Using a Positivist Research Philosophy

A positivist research philosophy is the leading research philosophy in IT research (Kautz and Pries-Heje 2013). Much of the research conducted on technology adoption has employed this philosophy (Lederer et al., 1998). Kautz and Pries-Heje (2013) argue that in technology adoption research, which aims to create knowledge that can explain and predict all similar situations, a positivistic research philosophy is appropriate. The rigid structure and design associated with a positivist research philosophy ensures reliability and validity of the research findings (Leung, Cooper and Perera 2011). Reliability refers to the consistency of the findings over time, and their generalisability; whilst validity refers to the extent to which a study measures the research problem addressed (Golafshani 2003). Accordingly, adoption of a positivist research philosophy in this study can enhance the level of reliability and validity of the model developed to predict the technology adoption intention of internal auditors.

Two to the most widely used research philosophies are the positivist and interpretivist research philosophies. Positivist and interpretivist research philosophies focus on different aspects. While a positivist research philosophy focuses on facts, interpretivism by contrast, focuses on values (Al-Habil 2011). An interpretivist research philosophy emphasises understanding the meaning people attach to their actions, which in turn regulates their actions (Al-Habil 2011). The objective of interpretivism is to understand human action in depth, rather than merely explaining it (White 2001). However, understanding and exploring the underlying beliefs and attitudes of internal auditors in relation to the adoption
of technology is not the focus of this research. Furthermore, interpretivist research believes that there is no universal law, since facts must be reached through subjective understandings which vary in each social context (Al-Habil 2011). This is not practical in the context of this study as the focus of this work is on gaining an objective understanding of the association between different variables and developing a standardised model for technology adoption intention among internal auditors. Development of a generalisable theory is not part of the philosophical tradition of interpretivism. The primary purpose of this research is to create a new framework that can predict technology adoption intention in public sector internal audit contexts and to ascertain the impact of the elements of technology adoption intention on the internal auditors’ perception of audit quality. Accordingly, this focus renders the interpretivist philosophy unsuitable for this study.

5.4.3 Research Approach

To generate credible data, the researcher uses existing theories to develop hypotheses which are then tested and confirmed (Bendassolli 2013). Accordingly, the research approach for this study is a deductive approach (Zalaghi and Khazaei 2016). A rigorous empirical examination is carried out on each hypothesis before rejecting, revising, or accepting it (Zalaghi and Khazaei 2016). This can contribute towards the further development of a theory which can be tested through additional research (Zalaghi and Khazaei 2016). The most widely used theories on technology acceptance namely, the theory of reasoned action (TRA), the technology acceptance model (TAM), and the unified theory of acceptance and use of technology (UTAUT), are all used to develop the conceptual framework for this study. The influence of technological, organisational, environmental and individual factors on the technology adoption intention of internal auditors is tested in the context of public audit organisations in Oman.
5.4.4 Impact of Positivist Research Philosophy on Research Design

Although a positivist research philosophy is associated with quantitative research methods, in this research, a qualitative research method was first employed, to ensure that the model developed in this study was in fact relevant in the internal audit context of the public audit institutions of Oman. It was considered that qualitative interviews would provide the perceptions of internal auditors in relation to technology adoption, which in turn would enable the researcher to ensure that relevant information was not overlooked in the conceptual framework development phase. Accordingly, qualitative interviews were undertaken prior to the quantitative survey phase, as a sense checking exercise to ensure that the model developed was as comprehensive as possible.

A major weakness acknowledged in technology adoption research using a positivist research philosophy pertains to the extensive reliance on quantitative survey based approaches, which although allow for the identification of key variables, do not enable the researcher to obtain deeper insights (Bhattacherjee, Limayem and Cheung 2012). Accordingly, a qualitative phase can help to address this perceived weakness. Additionally, the use of both qualitative and quantitative research methods allows the researcher to obtain a more comprehensive understanding of the influence of technological, organisational, environmental and individual factors on the intention to adopt technology in an internal audit context. Accordingly, Figure 5.1 presents the T-O-E-I conceptual framework, with all the hypotheses developed for this research, and their associations with technology adoption.
Next, Figure 5.2 presents the conceptual framework which explains the factors driving the association between the technology adoption intention and internal audit quality. This figure displays the hypotheses used for the second conceptual framework developed in this study which examines the factors underpinning perceptions of internal audit quality.
Figure 5.2 Conceptual Framework for Internal Audit Quality

Source: Author’s own
5.5 Phase 1: Qualitative Interviews

Phase 1 of this research study involved the use of qualitative interviews. Qualitative interviews provide the researcher with the opportunity to test the validity of the theories developed (Pomerantz and Zemel 2003). Additionally, interviews allow the respondents to express their perceptions about the research topic, and the feelings, attitudes, and meanings underlying these perceptions (Pomerantz and Zemel 2003). Given that the central objective of this study was already established by the development of the proposed theoretical models in Figure 5.1 and Figure 5.2, the purpose of the qualitative interview phase was to confirm the relevance of the factors examined by these models in the internal audit context, and to confirm that other relevant factors had not been overlooked.

Accordingly, internal auditors’ perceptions regarding the technological, organisational, environmental, and individual factors influencing the intention to adopt CAATs in internal audit institutions in Oman were collected via the qualitative phase along with their perceptions on internal audit quality. The idea was that any new information gained from this phase would be used to further develop and modify the proposed conceptual models to ensure they were comprehensive. The next section explains the process involved in determining the sampling strategy, choosing the interview type, approaching and conducting the interviews, and ultimately analysing the interview data.

5.5.1 Sampling Strategy

The population for this study consisted of internal auditors working in the audit departments of the Royal Court Affairs (RCA), the audit department of the Royal Army of Oman (RAO), and the State Audit Institution (SAI). Sampling is defined as the selection of a group of participants from the population for inclusion in the research study (Daniel
Sampling is necessary because it is often impractical to collect information from the entire population. The sampling method used for the qualitative research phase was purposive sampling. Purposive sampling is the most suitable method to conduct qualitative interviews if the participants are required to be from an expert group (Luton 2015). This method of sampling involves the selection of the best participants who will enable the research question to be answered (Teddie and Tashakkori, 2009). Purposive sampling was deemed necessary as it enabled the researcher to select the internal auditors capable of sharing the maximum information necessary for this research. In qualitative research, purposive sampling represents a widely used sampling method given that the participants are selected based on their ability to provide information that is necessary to achieve a rich understanding of the subject matter at the heart of the research (Klenke 2008).

Once a suitable sampling method was selected, the next step was to select an appropriate sample size. According to Marshall (2013), an adequate sample size in qualitative research allows the researcher to effectively address the objectives of the research. Unlike quantitative analysis, a large sample size is not considered necessary in qualitative analysis, since the sample is not used to generalise for the entire population (Klenke 2008). There are numerous recommendations in the literature regarding the optimum sample size for qualitative analysis (Creswell 1998, Mason 2010). For example, Creswell (1998) notes that an acceptable sample size for qualitative analysis can range from five to 25 interviews, while Guest et al., (2006) argue that there should be at least 15 interviews. The selection of an appropriate sample size in qualitative analysis is based on the concept of informational redundancy or saturation (Mason 2010, Sandelowski 1995). Informational redundancy is when the additional participants do not add any new information over the existing participants (Sandelowski 1995). Atran, Medin and Ross (2005) suggest that a
sample size of 10 is sufficient to establish consensus on the subject being examined. Since the qualitative analysis phase in this study was conducted solely to ensure that the conceptual model being developed was comprehensive, the minimum sample size necessary to achieve saturation was considered satisfactory. Accordingly, contact details for 15 internal auditors working in the three public audit organisations in Oman were obtained through personal work based contacts. All 15 participants were selected using purposive sampling and were phoned to ascertain if they would be interested in participating in this study. 12 of these agreed to participate. Since the sample size of 12 was within the recommended sample size range of 10 to 15 (Atran et al., 2005, Guest et al., 2006), the final sample size of 12 was considered sufficient.

To ensure that the interviewees selected were not strongly biased, the researcher ensured that the interviewees in question represented different internal auditor designations, such that the opinions of internal auditors from different levels of the organisations were reflected and considered. The participants included first auditors, team leaders, audit managers and heads of audit departments. This allowed multiple perspectives about the influence of technological, organisational, individual and environmental factors on technology adoption to be considered. Of the 12 participants involved, five were from the audit department of the RAO, five were from the RCA, and two were from the SAI. Nordin (2014) notes that employees from different hierarchical levels have different perceptions on organisational change, and because this study focuses on the adoption of information technology in an internal audit context, the perceptions of employees at different hierarchical levels is considered important. Table 5.1 provides profile information for the 12 interviewees.
Table 5.3 Profile of Interview Participants

<table>
<thead>
<tr>
<th>Auditor Number</th>
<th>Organisation</th>
<th>Job Title</th>
<th>Age</th>
<th>Gender</th>
<th>Experience (in years)</th>
<th>Highest Academic Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RAO</td>
<td>Audit Team Leader</td>
<td>37</td>
<td>Male</td>
<td>15</td>
<td>Bachelor in Accounting</td>
</tr>
<tr>
<td>2</td>
<td>RAO</td>
<td>First Auditor</td>
<td>32</td>
<td>Female</td>
<td>10</td>
<td>Diploma in Accounting</td>
</tr>
<tr>
<td>3</td>
<td>RAO</td>
<td>First Auditor</td>
<td>32</td>
<td>Female</td>
<td>11</td>
<td>Bachelor in Accounting</td>
</tr>
<tr>
<td>4</td>
<td>RAO</td>
<td>First Auditor</td>
<td>37</td>
<td>Male</td>
<td>13</td>
<td>Bachelor in Accounting</td>
</tr>
<tr>
<td>5</td>
<td>RAO</td>
<td>Head of Audit Department</td>
<td>52</td>
<td>Male</td>
<td>27</td>
<td>Not Available</td>
</tr>
<tr>
<td>6</td>
<td>RCA</td>
<td>Audit Manager</td>
<td>39</td>
<td>Female</td>
<td>14</td>
<td>Bachelor in Finance</td>
</tr>
<tr>
<td>7</td>
<td>RCA</td>
<td>First Auditor</td>
<td>34</td>
<td>Male</td>
<td>11</td>
<td>MSc in Business</td>
</tr>
<tr>
<td>8</td>
<td>RCA</td>
<td>Audit Team Leader</td>
<td>35</td>
<td>Male</td>
<td>11</td>
<td>Bachelor in Finance</td>
</tr>
<tr>
<td>9</td>
<td>RCA</td>
<td>First Auditor</td>
<td>36</td>
<td>Male</td>
<td>10</td>
<td>Bachelor in Accounting</td>
</tr>
<tr>
<td>10</td>
<td>RCA</td>
<td>First Auditor</td>
<td>36</td>
<td>Male</td>
<td>10</td>
<td>Bachelor in Finance</td>
</tr>
<tr>
<td>11</td>
<td>SAI</td>
<td>First Auditor</td>
<td>33</td>
<td>Male</td>
<td>11</td>
<td>Bachelor in Accounting</td>
</tr>
<tr>
<td>12</td>
<td>SAI</td>
<td>Audit Team Leader</td>
<td>34</td>
<td>Male</td>
<td>11</td>
<td>MBA</td>
</tr>
</tbody>
</table>

The next sub-section defines and justifies the choice of interview type selected for this phase of the research.

5.5.2 Choice of Interview Type

The interview is the most common research method used when the researcher needs to understand the experience of the interviewees, and the underlying meaning of that
There are three main interview sub-types namely, structured, semi-structured and unstructured interviews (Gill et al. 2008). In structured interviews, the questions are predetermined, and asked of the respondents in a pre-defined order. Unstructured interviews are open-ended and free flowing in order to facilitate an understanding of the interviewee’s experience and perspective, and to motivate the respondents to communicate in rich detail (Craig 2005).

Unstructured interviews use an evolving set of questions for participants which are adapted based on the responses of earlier participants (Bailey 2007). Unstructured interviews are regarded as somewhat unreliable (Craig 2005). This is because there can be a wide variation in the questions asked of each participant, which results in both a lack of clarity and errors in judgement when analysing and interpreting participant responses (Hersen, Sugai and Horner 2005). In contrast, structured interviews produce more reliable results as they follow well-defined rules (Craig 2005). Structured interviews consist predominantly of closed-ended questions which give the interview participants a uniform experience (Patel 2014). However, a major weakness of structured interviews pertain to their neglect for exploring the individual perspectives of the respondents which can add to the richness of the data (Craig 2005).

The semi-structured interview represents a hybrid of a structured and unstructured interview in that while there is a set of pre-determined questions asked, the interviewer nonetheless has the opportunity to proffer additional probes or queries (Whiston 2013). This method of qualitative interviewing allows interactional exchange of dialogue between the interview participant and the researcher whilst ensuring that the main issues of the research are addressed (Edwards and Holland 2013). Semi-structured interviews were
considered most appropriate for this phase of the study as they allowed the researcher to ask pre-determined questions while having the capacity to ask follow up questions to obtain further information or clarification (Barriball and While 1994). Accordingly, semi-structured interviews were used to obtain an in-depth understanding of the internal audit context in Oman from the perspective of internal auditors in the three public audit organisations in Oman.

The semi-structured interviews designed for this research study used a protocol based on the proposed theoretical models, but remained open and flexible to probe the interviewees to obtain further detail on the questions asked. According to Barriball and While (1994), semi-structured interviews permit the exploration of the perceptions and opinions of the interview participants on areas that are both complex and sensitive. This research method is considered suitable for collecting data concerning the practices, beliefs and opinions of the participants (Eldabi et al., 2002). Hence, from the perspective of this study, semi-structured interviews enabled the researcher to confirm the theoretical models proposed, but also to gather information about technology adoption intention in an internal audit context.

### 5.5.3 Approaching and Conducting the Semi-Structured Interviews

The researcher chose a semi-structured interview method as a key way of collecting qualitative data for this research. The researcher relied on the works of Hader, Hader and Kuhne (2012) to ensure openness and objectivity whilst undertaking the interviews. On one hand the researcher wanted to offer the respondents some level of autonomy such that the answers they provided would represent true experiences in practice. On the other hand,
the researcher wanted to confine the answers to some level of specificity. It is upon these bases that the researcher framed the interview questions.

There were two main steps involved in undertaking the semi-structured interviews for this phase of the study. The first step was to issue a letter to the participants, detailing the purpose of the research, and assuring them of the confidentiality of the information they provided, as well as their anonymity (Appendix I). The second step involved phoning the 12 participants to confirm their interest in participating in the interview phase and to agree the location and timing of the interviews.

Face to face interviews were considered superior to telephone interviews and other forms of electronic interviewing for performing the interviews. Apart from overcoming the inherent limitations of technology including the risk of dropping calls, and a lack of clarity; face to face interviews can enhance the relationship between the researcher and interviewer (Hader, Hader and Kuhne 2012). According to Hague, Hague and Morgan (2004), face to face interviews can ensure that interview participants remain focused and interested in the research for longer. Furthermore, the chances of misunderstanding or mishearing can be reduced and responses can be probed further (Bernard and Bernard 2012, Hague et al., 2004). Even so, face to face interviews can be challenging since the participants may feel reluctant to share details of their experiences with a complete stranger (Marlow 2010). Nevertheless, in face to face interviews both the researcher and participant have access to verbal and non-verbal cues which can be effective in building a rapport, thereby establishing trust and openness to enable interview participants to talk more freely (Gubrium and Holstein 2002).
The researcher agreed to meet each participant in a location and at a time convenient for them to conduct the interviews. The location in which the interview is conducted plays a crucial role in enhancing the quality of interview responses (McCall 2008). A convenient location for the participant enhances their sense of safety and comfort, which not only increases participation rates, it also results in higher quality responses (Magnusson and Marecek 2015). Ensuring the comfort of the participant is necessary to build a good relationship between the researcher and the participant (Magnusson and Marecek 2015). The strength of the relationship created during the interview process can significantly increase the strength of the research validity (Kuzmanić 2009).

The researcher must employ appropriate interviewing techniques to engage participants in the interview (Tollefson et al. 2001). According to Tollefson et al., (2001) the techniques used to engage a very silent participant differ to those required in the case of a very articulate participant. For very silent participants, the researcher must use gentle prompts to maintain the flow of the conversation, whilst for more articulate participants it may be necessary to ensure that the conversation remains within the topic discussed (Tollefson et al., 2001). The researcher took the stance of listening to the participants and probing when necessary to ensure that the participants were free to share their knowledge and understanding of the influence of technological, organisational, environmental, and individual factors on their intention to adopt technology in their respective organisations. Each interview commenced by asking the interviewee to complete the interview consent form (Appendix III). Thereafter, the researcher collected demographic information from the participants including their name, age, education, years of experience, and details concerning their employing organisation. The interview protocol used for the interviews was in English (Appendix II). If there was any doubt or confusion in relation to any of the
questions, the meaning was explained in Arabic to the respondent if required. The interview responses were provided in Arabic, and thereafter translated to English. The interview guide was approved by the Dublin Institute of Technology (DIT) Ethics Committee. The average length of each interview was 45 minutes. Although permission was requested from all participants to record the interviews, only nine gave permission to do so. Those nine interviews were transcribed shortly after they took place. The remaining three interviewees requested that their interview not be recorded, but they allowed the researcher to take manual notes of the responses. The transcripts prepared from the interviews were examined by an independent Arabic and English speaker whilst reading the transcripts so as to give confidence that the translations were performed accurately. In this research, the researcher and the interview participants are all from the same cultural and professional background. This can have a positive effect on the interview relationship since it can significantly reduce miscommunication (Raddawi 2014).

5.5.4 Analysing the Data

The primary objective of qualitative data analysis is to analyse and interpret the data collected to discover meaningful patterns within it (Auerbach and Silverstein 2003). Once the interviews were transcribed, the next step involved organising the data collected into themes and sub-themes (Marshall et al., 2013). Accordingly, the main issues from the interview transcripts were coded to specific themes extracted from the literature. Since the central focus of this research was determined before undertaking the interviews, managing the data based on the participants’ perceptions, attitudes and feelings about the influence of technological, organisational, environmental and individual factors was not unreasonably onerous. Furthermore, the transcripts were carefully read to ensure that any new themes or sub-themes were not overlooked.
5.6 Key Findings

The semi-structured interviews revealed that while most of the participants favour adopting CAATs for internal auditing, currently the usage of technology in their audit environment is limited. As one participant stated:

We don’t use IT in my audit department (Auditor number 1, audit team leader, RAO).

Another participant echoed this point saying:

We don’t have IT in the RAO, so how can I describe it to you (Auditor number 2, first auditor, RAO).

Both of these participants represent the RAO, which is a public audit organisation that has not yet implemented information technology. However, the other two audit organisations have engaged with IT to varying degrees. Accordingly, a respondent at the SAI shared a different view, saying:

We started using IT in our audit department recently. The management has introduced the trend and I have realised that the process of carrying out an audit is faster and more efficient than it was previously (Auditor number 11, first auditor, SAI).

Similarly, an audit team leader at the RCA reinforced this particular view. He explained:

We use technology in our organisation. The use of technology has enhanced efficiency in the audit process and has made the process faster (Auditor number 8, team leader, RCA).

Accordingly, whilst adoption of CAATs is low in the context of internal audit in the public organisations in Oman, overall, the interviewees revealed a positive attitude towards CAAT adoption. The key benefits the respondents associated with technology adoption
included increased efficiency, easier access to data, and enhanced information sharing (Sun, 2009). The interviewees also identified human error reduction and lowered internal audit risk as important benefits of adopting CAATs for internal auditing. This positive attitude was captured effectively by one participant who stated:

I believe that the adoption of IT minimises the chances of human error in auditing. In my view, it enhances control of the organisation (Auditor 4, audit team leader, RAO).

Despite the enthusiasm articulated by a majority of the respondents towards the adoption of technology for auditing purposes, inadequate support from top management was cited as a major barrier to its adoption (Sun 2009). Feedback from the participants indicate that the decision to adopt CAATs for internal auditing rests with management which serves as evidence of the high power distance in the public audit organisations of Oman. Accordingly, adoption of the technology would appear to be largely dependent on the views of senior management. Furthermore, responses obtained also demonstrate that the internal auditors largely accept the unequal power and hierarchical organisational structure in these organisations. This was captured by a respondent who asserted:

I think it would be good if the RAO adopted technology. In the end, it depends on our head of audit (Auditor number 2, first auditor, RAO).

This reinforces the findings of existing research which shows that top management support plays a central role in the effective implementation of CAATs for internal auditing (Cohen and Sayag 2010, Enofe et al., 2013).
All interview participants acknowledged that top management play a critical role in the adoption of IT for auditing. In this regard, a senior auditor in the RAO emphasised that in his view top management favour CAAT implementation:

Senior management is interested in auditing technology and is working to develop it and give attention to this aspect (Auditor number 5, Head of Audit department, RAO).

Nevertheless, auditors at lower levels dispute this view, and suggest that the actions of top management are not conducive to CAAT adoption. As one respondent proffered:

I think the RAO will take a long time to adopt IT and give us training (Auditor number 2, first auditor, RAO).

This sentiment was echoed by other interviewees in the RCA:

There is a lot of resistance from my top management concerning the adoption IT in internal audit, and I do not think that there is any plan or intention shortly concerning the adoption of IT in internal audit (Auditor number 6, first auditor, RCA).

Adoption of CAATs is regarded as a major change and hence, resistance from top management is not uncommon (Curtis & Payne 2008). Concerns raised by the interviewees regarding the adoption of CAATs in their working environment included difficulties associated with adjusting to the new audit environment, and the time needed to both implement, and learn how to operate the new technology. One of the auditors in the RCA elaborated on this aspect as follows:

The use of IT initially elicited differences between the management and the IT department. The process of training the staff members on the use of the technology was an expensive and time consuming exercise. The entire process of
integration of IT into the audit process was difficult (*Auditor number 9, first auditor, RCA*).

The majority of the interviewees recognised that there is a movement towards the adoption of information technology, and they indicated that they are willing to adapt to the changes in the global environment. Despite their enthusiasm towards CAAT adoption however, the interviewees suggest that the adoption of CAATs in their organisation is contingent on the organisational environment in terms of technology readiness and top management support (Curtis & Payne 2008). To this end, one interviewee observed:

Technology is very important in modern audit work. However, the environmental factors prevailing at an institution can determine how one can adopt and use the IT in audit practice (*Auditor number 3, first auditor, RAO*).

Most of the participants shared the viewpoint that technology can positively contribute towards the quality of internal auditing in their organisations. One participant explained:

Utilising the computer in the field of audit is in itself keeping abreast of developments in the world of technology, and will contribute to the accuracy and quality of audit work (*Auditor number 2, first auditor, RAO*).

This is consistent with existing research which suggests that CAATs can improve audit quality (Mansour 2016, Omonuk and Oni 2015).

Another participant observed that CAATs contribute towards higher quality audit work through higher perceived ease of use (effort expectancy) and performance expectancy. This participant explained:
In my opinion IT will reduce the efforts for internal auditing. Currently, a significant amount of effort and time is spent on manual labour *(Auditor number 6, audit manager, RCA)*.

Culture and power structure are recognised as dominant features of the internal audit organisations in Oman. There were several instances during the interviews where the participants identified the superior role played by senior management in decisions within their organisations. This highlights that power distance, one of the elements of the Hofstede and Hofstede (2005) framework, that was applied in other Arab countries may also apply in this context, in that power-distance is high and thus there are unequal distributions of power. For example, most of the internal auditors from the Royal Army of Oman acknowledged that adoption of IT is mainly dependent on the attitude of the head of their audit department and individual attitudes and personal opinions of auditors was of lesser value in that regard. This was captured by one auditor who noted:

> The head of the audit department is in a rank of brigadier general and he has the authority to make any changes in the department. As I said, it depends on the head of audit. *(Auditor number 2 Auditor Assistant, Royal Army of Oman)*

Similarly another participant working in the Royal Army of Oman stated:

> As our society is encouraged to use IT in different fields, our management will be encouraged to adopt IT in audit. It depends on the head of audit *(Auditor number 3, First Auditor, Royal Army of Oman)*.

In another instance the same participant stated:

> It will be good to adopt IT in the audit department in the RAO since it will make a lot of changes and we can complete our work more accurately. I will be honest
with you and you know that no one will take your opinion in such thing (Auditor number 3, First Auditor, Royal Army of Oman).

This comment suggests that even if the individuals in the RAO suggest the furtherance of CAATs in the organisation, they are not likely to be heard and that as per the two earlier quotes, it all “depends on the Head of Audit”. This is evidence of a very centralised structure (Combe, 2014) and a culture that acknowledges authority (Alzeban, 2015).

Another participant from the Royal Army of Oman noted:

Top management gives us all the support we need. Everything depends on them (Auditor number 4, First Auditor, Royal Army of Oman).

The responses from these participants indicate that the decision to adopt IT based internal auditing will be solely based on the attitude of the head of the audit department and the subordinate internal auditors have no major input in this decision. Even where the participants have a favourable attitude towards IT based internal auditing, this does not result in technology adoption as the final decision rests with the head of internal audit. This is further evidence that the culture is collectivist (Cassell and Blake, 2011). These quotes also support the existence of a highly centralised organisational structure (Mauel et al., 2001) in the organisations under investigation. Given the high status of these organisations in Oman and their direct linkages to central government (SAI), the Sultan himself (RCA) and the army (ROA), the individuals within the organisations demonstrate a culture that respects power and implies a high level of subordination of the auditors (Butler and Rose, 2011). As a result, while the individual auditors are interested in CAATs, they are somewhat fatalistic about their introduction. They know that they will have little power to bring about such change but when it comes it will be embraced within the organisations. As a result culture and power play an important part in the adoption decision at organisational level.
5.7 Conclusion

This chapter articulated the research question at the heart of this study and detailed the key objectives of this research. The research design including details of the research philosophy and research approach were discussed. A positivist research philosophy with a deductive approach was adopted for this research, as this is the most appropriate means for developing theoretical models that can be generalised in different internal audit contexts. The primary objective of this research was to develop two theoretical models, one to measure the internal auditor’s intention to adopt technology, and one to measure the impact of elements that influence technology adoption on internal audit quality. To achieve these research objectives, this research study was divided into two distinct phases. The research methodology adopted for Phase 1 of this study was discussed in this chapter.

Phase 1 consisted of qualitative interviews with 12 internal auditors in the three public audit organisation in Oman namely, the SAI, the RAO and the RCA. The purpose of the qualitative interview phase was to confirm the relevance of the factors that are examined in both of the theoretical models and to identify if any pertinent factors had been overlooked. The research method for the qualitative interview phase including details pertaining to the sampling strategy employed and interview type adopted, were explained and justified. Thereafter, the approach employed in analysing the data was outlined. Finally, the key findings from the qualitative research phase were discussed and analysed in this chapter.

A total of twelve interview participants selected using a purposive sampling technique took part in the semi-structured interviews. All the interview data collected was transcribed and
thematically analysed. The key findings from this phase of the research indicate that the current level of adoption of information technology is limited in Omani public audit organisations, but there is a general disposition towards adopting technology. CAATs are not available in public audit. Another major finding to emerge is that although there is a general willingness among internal audit staff to adopt technology, major decisions of this nature are taken specifically by top management. Accordingly, power sharing within the public audit institutions in Oman is imbalanced, and that is generally accepted by subordinates. All the variables in both conceptual models were identified to be important and relevant in determining technology adoption intention, and no additional factors were identified from the interview phase. The next chapter explains the research approach adopted for Phase 2 namely, the quantitative survey.
6. Methodology Phase 2: Quantitative Survey

6.1 Introduction

A quantitative questionnaire was employed as the main research method for this study. The quantitative survey represents the method of choice when the objective is to generate numerical data to support or refute the hypotheses developed in the research (Creswell 2013). The quantitative survey instrument was designed to examine the two theoretical frameworks for this research namely, (1) the T-O-E-I Framework which examines the factors that influence the technology adoption intention of internal auditors as per Figure 5.1, and (2), the Audit Quality Framework which examines the impact of the elements that influence technology adoption on audit quality, as presented in Figure 5.2. In Phase 2 of the research process, the two theoretical frameworks and hypotheses developed were tested against the quantitative data collected. This facilitated the identification of the main factors that influence the technology adoption intention of internal auditors, as well as the main factors that impact on the perception of internal audit quality. This chapter explains the methods used to conduct the quantitative survey, including the sampling method applied, and the process involved in instrument development, data collection and hypotheses development.

6.2 Justification for Survey Strategy

The survey strategy is not only the most suitable, but also the most widely used quantitative research strategy, as it allows the collection and analysis of the large quantity of data required to form valid and reasonable conclusions, in a cost efficient and timely manner (Mathers, Fox and Hunn 2009). Survey research allows one to obtain specific information from the respondents to specifically address the research problem by designing a valid and reliable instrument (Ponto 2015). Furthermore, a survey allows the collection of a large
amount of data that is representative of a large population to form generalisable conclusions (Ponto 2015). Quantitative data collected using a survey strategy can be employed to examine the relationship between variables and enhance the development of models by examining these relationships (Punch 2003). This is because a survey strategy allows one to draw conclusions with a high degree of certainty (Sukamolson 2010). Because one of the aims of this research is to develop a model to predict technology adoption intention in an internal audit context, it is necessary to achieve specific answers from respondents who can represent the internal auditors of the public audit institutions in Oman. This is best achieved using a survey strategy.

To examine the factors that significantly influence technology adoption intention in an internal audit context, and to identify the impact of the elements that influence technology adoption on the quality of internal audit, hypotheses were developed from existing research (Prasad, Rao and Rehani 2001). This allowed the identification of the main variables that influence technology adoption intention, as well as the nature of the association between the elements that influence technology adoption and internal audit quality. The survey strategy was employed to collect the data to achieve the research objectives and to assess the research hypotheses. The next section details the process surrounding hypotheses development for this research.

6.3 Hypotheses Development T-O-E-I

Adoption of new information technology raises various difficulties and uncertainties (Jurison 2000). The initial adoption rate of IT in practice depends on the user’s perception of the technology, including the potential outcomes and benefits (Liao and Lu 2008). Technology adoption can enhance the performance of the organisation, contribute towards
achieving its business objective and create competitive advantage (Murmura and Bravi 2018). When firms believe that adopting IT can result in revenue generation and improved overall efficiency, they will be eager to embrace new technology (David et al., 2010). The perception concerning the benefits technology offers in terms of improving the efficiency and effectiveness of operations is a key reason for organisations investing in technology (Caldeira, Serrano, Quaresma, Pedron and Romao 2012).

The decision to adopt technology is based on the evaluation of the perceived benefits of the technology compared to the adoption costs (Vasarhelyi and Romero 2014). For instance, when top management believe that the high costs of adoption may not translate into higher productivity and profits, the intention to adopt new technology will be very low (David et al., 2010). Accordingly, if auditors believe that adopting CAATs will help to improve internal auditing and their job performance, they will be more inclined to adopt CAATs (Rosli et al., 2012). Perceived benefits of adopting CAATs may include increased performance, better access to data across the team and easier work sharing within the internal audit team (Moorthy et al., 2011). An examination of the literature on the influence of technology benefits on technology adoption is used to develop the first hypothesis. Accordingly, the first hypothesis is as follows:

**Hypothesis 1: The greater the level of the expected benefits of technology, the higher will be the internal auditor’s intention to adopt CAATs.**

Adoption of new technology is typically slow and incomplete when the perceived risks are high, or if there is an aversion to risk (Ross, Santos and Capon 2010). Risks that are often associated with the adoption of new technologies and which lead to delays in the adoption
of new technology include the risk of obsolescence, risks associated with high switching costs and the risk of self-cannibalisation (Paulino 2014). According to Moorthy et al., (2011) the perceived risks associated with CAAT adoption include the risk of data loss and network breakdown. Several studies have identified that the risk aversion of individuals negatively influences the technology adoption decision (Barham, Chavas, Fitz, Sales and Schechter 2014; Engle-Warnick, Escobal and Laszlo 2011). Risk aversion in this context arises due to the uncertainty and potential lack of reliability associated with the new technology (Hannan and Freeman, 1984; Paulino, 2014).

When top management perceives the risks as high, and are unwilling to take those risks, they are unlikely to expend financial resources on new technology adoption (Rosli, Yeow and EuGene 2013). In larger firms and government organisations, high-risk technologies can be adopted more easily because such firms and organisations are more capable of bearing the risks due to their higher level of financial stability compared to smaller firms (Wang, Chang and Heng 2004). Accordingly, larger firms are more likely to adopt technologies even when risk is high, as they have sufficient resources to cope with those risks (Wang et al., 2004). According to Qian, Fang and Gonazalez (2012), large organisations have specialised resources and supports to manage vulnerability and risks associated with the adoption of complex technologies. Technology adoption requires a significant initial investment, and the benefits are achieved over the longer term. The initial difficulties in securing access to financial resources and training staff makes the process of adopting new technology challenging (Wang et al., 2004). Accordingly, the second hypothesis developed is as follows:

**Hypothesis 2: The higher the level of perceived technological risks, the lower will be the internal auditor’s intention to adopt CAATs.**
The intention to adopt new technology originates from top management who perceive their firms as dynamic and interactive, having strong financial and human resources, and willing to accept risks and complexity (Robert et al., 2009). The commitment and involvement of top management influences the adoption of technology such as CAATs in audit firms (Rosli et al., 2012). General support of top management plays a crucial role in supporting the successful adoption and implementation information technology, and ensuring the success of information technology (Kashada, Li and Koshadah 2018). Studies show that poor top management support in the implementation of technologies in the form of barriers to effective implementation and not allocating adequate resources to implement IT adversely affect proper adoption of technology (Bezboruah, Paulson and Smith 2014; McGinn et al. 2011). This is because top management support establishes the conditions and makes available the resource for adopting technology (Low, Chen and Wu 2011; Wang, Wang and Yang 2010).

Top management must link CAATs with their firm’s competitive strategies; accept the risks involved in the adoption of CAATs; provide adequate financial resources for CAAT implementation; and show their support for CAAT usage in their firm’s operations to ensure the smooth adoption of CAATs within their firms (Rosli et al. 2013). Accordingly, the following hypothesis is proposed:

**Hypothesis 3: The higher the level of top management support, the higher will be the internal auditor’s intention to adopt CAATs.**

Organisations facing IT adoption pressures from management will be interested in adopting technology (Wang et al. 2004; Patterson, Grimm and Corsi 2003). However, when the pressure
from management is very high, this creates an obedience pressure in employees, which can adversely affect their attitude towards technology (Davis, DeZoort and Kopp 2006). Obedience pressure is when an authority figure has a significant influence on the behaviour of individuals (DeZoort and Lord 1994). When this pressure is coercive, it creates an aversion towards the technology on the part of the employees, making them less inclined to adopt the new system (Janvrin et al. 2008, Oliveira and Martins 2011).

For instance, management may impose the adoption of technology because when technology is adopted, the organisation may be considered more prestigious (Lee et al. 2001). Pressure from management depends on organisation-specific factors such as the availability of organisation resources, pressure from stakeholders such as customers, and competitive pressures (Lee et al. 2001). When the pressure to adopt technology is high, employees may experience professional and ethical conflicts leading to dysfunctional behaviour including the deliberate misrepresentation of information or facts to superiors (Davis et al. 1989). Thus, the following hypothesis is developed:

**Hypothesis 4: The higher the level of pressure from management, the lower will be the internal auditor’s intention to adopt CAATs.**

When audit software is implemented, this reduces the time spent by the auditor on the preparation of working papers, and decision making is facilitated by the electronic presentation of accounting information (Rosli et al. 2012). When the auditor faces time pressure, this may lead to various organisational, individual, and social consequences, including reduced quality of work, health issues, and staff turnover (McNamara and Liyanarachchi 2008). CAATs which reduce the audit hours expended on a task, and
increase the capacity of auditors to evaluate the entire population, positively influence the adoption intention of audit teams (Curtis and Payne 2006). However, Sun (2012) asserts that in the short term, the time spent by auditors on the acquisition and conversion of data for performing CAATs is in fact equal to the time spent on audits without the use of technology. That being the case, in the longer term, CAATs actually allow internal auditors to better manage time pressure (Sun 2012). From this, the following hypothesis is developed:

**Hypothesis 5: The higher the level of audit time pressure, the higher will be the internal auditor’s intention to adopt CAATs.**

Internal auditor independence is a major determinant of the objectivity and integrity of the work of the internal auditor (Bédard et al. 2008). The internal auditor’s intention to provide independent judgements on various functions of the client organisation can positively influence technology adoption (O'Leary and Watkins 1995). This is because information technology adoption allows internal auditors to maintain data integrity, employ resources efficiently, and safeguard assets (Cascarino 2012). Technology adoption facilitates the maintenance of accurate and complete information necessary for the performance of internal audit functions, thus achieving the objective of the audit organisation (Cascarino 2012). Independent internal auditors who wish to perform tasks with integrity and objectivity would therefore choose to adopt technology. Thus, the importance of auditor independence is likely to have a positive effect on technology adoption. Accordingly, the following hypothesis is developed:

**Hypothesis 6: The higher the level of internal auditor independence, the higher will be the internal auditor’s intention to adopt CAATs.**
Individual readiness is a critical factor that influences change implementation (Vakola 2014). This concept also explains organisational change, since the acts of employees determines the organisations’ readiness to change (George and Jones 2001). An individual’s predisposition to act in a certain way is based on their personality traits (Vakola, Oreg and Armenakis 2013). Four dimensions namely optimism, innovativeness, discomfort and security have a significant influence on an individual's technology readiness (Parasuraman 2000). Several studies have identified the significant impact of optimism, innovativeness, discomfort and insecurity on the individual’s decision to adopt technology. However, few studies have identified that discomfort and insecurity do not have a significant impact on the technology adoption of experienced users (Chiu, Fang and Tseng 2010; Godoe and Johansen 2012). Accordingly, this indicates that discomfort and insecurity inhibit technology adoption among experienced users of technology.

Optimism refers to the individual’s positive attitude towards technology, and the perception that technology use will result in flexibility, enhanced control and efficiency in completing tasks (Magotre et al. 2016). Innovativeness is the tendency of individuals to be pioneers of technology (Parasuraman 2000). Optimism and innovativeness are therefore facilitators of technology adoption (Magotra Sharma and Sharma 2016). The study conducted by Magotra et al., (2016) found that optimism results in the most significant positive variance in technology adoption.

Discomfort with technology adoption refers to a situation when the individual perceives that he has a lack of control over technology, and feels overwhelmed. Insecurity refers to the perception of the individual concerning the impact of technology on their health and
safety (Parasuraman 2000). Discomfort and insecurity are two inhibitors to technology adoption (Magotra et al. 2016). Accordingly, this leads to the next hypothesis which consists of four sub-hypotheses. They are as follows:

**Hypothesis 7: The higher the level of the organisation’s technology readiness, the higher will be the internal auditor’s intention to adopt CAATs.**

- **H7a** - The higher the level of optimism of an internal auditor, the higher will be the internal auditor's intention to adopt CAATs.
- **H7b** - The higher the level of innovativeness of an internal auditor, the higher will be the internal auditor’s intention to adopt CAATs.
- **H7c** - The higher the level of discomfort of an internal auditor, the lower will be the internal auditor’s intention to adopt CAATs.
- **H7d** - The higher the level of insecurity of an internal auditor, the lower will be the internal auditor’s intention to adopt CAATs.

Using technology for auditing can enable auditors to verify 100% of the transactions in a population and perform real-time audits and reports (Vasarhelyi and Romero 2014). Usage of CAATs by auditors was found to increase their productivity, drive faster accomplishment of tasks, and reduce their time spent on unproductive activities, thereby increasing the quality of their outputs (Mariaka 2012). In the study undertaken by Mazhan and Lymer (2007) it was found that usage of CAATs for more than 20 years in internal auditing increased audit quality and the level of assurance provided, as the auditors were able to achieve 100% coverage of the population.
The key reasons for an auditor adopting technology in auditing include increased transparency, increased audit efficiency and reduced risk of fraud and abuse (Moorthy et al. 2011). When the organisation is aware of the advantages of the proposed technology, they are more likely to adopt that technology (David et al. 2010). As per Venkatesh et al., (2003) the key aspects associated with embracing new technology include performance expectancy, effort expectancy, social influence and facilitating conditions. When employees expect technology to improve the performance of their jobs, the chance of them adopting that technology is higher (Rosli et al. 2012, Dillon and Morris 1996). Accordingly, the following hypothesis is developed:

**Hypothesis 8: The higher the expected performance by adopting technology, the higher will be the internal auditor’s intention to adopt CAATs.**

When technology is thought to be straightforward to apply, the probability of adopting that technology is greater (Lee et al. 2001). Similarly, the lower the level of effort required for using the technology, the more motivated employees and management will be to adopt it (Rosli et al. 2012). When auditors feel that technology will assist them in accomplishing required tasks without excessive effort or difficulty, again, they will have a greater inclination to do so (Rosli et al. 2012). This suggests that the perception that CAATs are easy to use increases the internal auditor’s intention to adopt them. Informed by this, the following hypothesis is developed:

**Hypothesis 9: The lower the level of effort expectancy, the higher will be the internal auditor’s intention to adopt CAATs.**
The attitude of another individual or group influences the behaviour of individuals (Eckhardt, Laumer and Weitzel 2009; Graf-Vlachy, Buhtz and König 2018). For this reason, when there is a favourable attitude among the peer group of social groups towards adopting a specific behaviour, the individual is more likely to perform in accordance with the preferences of the peer group. This is because the individual feels pressured to act like others and not stand alone (Eckhardt et al. 2009). An individual can be influenced to adopt new technology via pressure from industry, the competition, business partners and government authorities (David et al. 2010).

Auditors are likely to feel prone to social influence from their superiors, and so their decision to adopt technology may be dependent on pressure based judgments (David and Liming 2004). When the auditors feel that it is important for them to use new technology when others expect it to be used, the new technology is more likely to be adopted (Mazman, Usluel and Çevik 2009). Accordingly, social and cultural factors influence the decision of the auditor to adopt technology (Oliveira and Martins 2011). When everyone in the industry is adopting the new technology, then the practice within that industry results in the firm embracing that technology (Vannoy and Palvia 2010). Accordingly, the following hypothesis is developed:

**Hypothesis 10: The higher the level of social influence to adopt technology, the higher will be the internal auditor’s intention to adopt CAATs.**

The physical facilities and technical infrastructure provided by the firm influences the decision to adopt a new technology (Venkatesh et al. 2003). The main challenges involved in adopting and implementing technology derive from the lack of skills, capacity,
knowledge, technical infrastructure and finance (Paul et al. 2015). Facilitating conditions denote the conditions that support the use of technology. Research indicates that more conditions supporting the use of technology motivates people to use technology (Paul, Musa and Nansubuga 2015). The supporting conditions that can motivate individuals to adopt new technology can be in the form of technical and organisational infrastructure (Paul et al. 2015). Accordingly, the following hypothesis was developed:

**Hypothesis 11: The higher the level of facilitating conditions within the audit organisation, the higher will be the internal auditor’s intention to adopt CAATs.**

6.4 Survey Instrument Design

The first section of the questionnaire developed in this research appears in Appendix IV and covers general background and participant profile information including age, gender, job title, CAATs adoption information, and general organisational information. Section Two to Five inclusive, examines the influence of technological factors, organisational factors, environmental factors, and individual factors respectively on the respondents. The questions used were developed from existing models namely, the theory of reasoned action (TRA), the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT). The items for each construct were taken from former studies to ensure that they had been tested previously, and hence, that their validity and reliability was assessed previously. However, the reliability and validity of these items were also tested before the model was refined for regression testing in this dissertation.

Questions from Sections Two to Five inclusive were arranged on a Likert scale from one to seven, whereby one is strongly disagree and seven is strongly agree. A seven point rating
scale was used for the semantic measurement questions. Past research demonstrates that the greater the number of points on a rating scale, the greater the sensitivity of measurement and extraction of variables (Krosnick and Presser 2009). Rating techniques using Likert scales are highly recommended owing to their simplicity and symmetry, which makes them easier for the respondents to undertake, thus increasing the response rate (D'Amico 1957). The following section focuses on the different components of the questionnaire as well as the questions used, and the rationale for using these questions.

6.4.1 Section One: Demographic Information

Section One of the questionnaire gathers information concerning respondent demographics as well as general information about the three audit organisations in Oman, and the intentions of the auditors regarding technology adoption within these organisations. The objective of this section was to gain an overview of the demographic profile of the respondents such as gender, age group, job title, highest academic qualification and characteristics of their audit organisations. Information in this section facilitates an understanding of the distribution of the participants who took part in the study, and in turn enables the examination of the demographic factors that may influence the intention to use technology in Omani state audit organisations.

6.4.2 Section Two: Organisational Profile

Section Two of the questionnaire focuses on the organisational profile, and is used to examine the influence of three organisational factors namely, technological readiness, top management support, and pressure from management on the internal auditor’s intention to adopt CAATs. The constructs for technology readiness, top management support and pressure from management are explained next, along with the items used to measure each
of these constructs. In order to attempt to make the flow of the questionnaire easier for respondents, all the technology related items (risks, benefits and readiness) were placed proximate to each other.

6.4.2.1 Construct: Technological Readiness

Technology has greatly transformed the process of service delivery. The scope of transformation is clear, as reflected in the development of foundational statistics (Melin, Nordqvist and Sharma 2013). Technology readiness captures one’s tendency to adopt technology and use it to attain goals at home and at work (Parasuraman and Colby 2015). The items for this construct were adopted from Parasuraman and Colby (2015). Parasuraman and Colby (2015) created a concise and comprehensive index to measure the propensity to adopt new technologies, or technology readiness, which allows the measurement of the internal auditor's propensity to adopt new technology. The technology readiness index (TRI) developed by Parasuraman and Colby (2015) provides a concise, contemporary, and multifaceted construct to measure an individual’s inclination to adopt technologies. Other studies that have examined technology readiness have also utilised this particular index (Godoe and Johansen 2012, Pires, da Costa Filho and da Cunha 2011). Accordingly, the technology readiness index is considered the most appropriate instrument to measure technology readiness of internal auditors in this study. Table 6.1 presents the items used to measure the construct technology readiness.
Table 6.1 Items for Construct Technological Readiness

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerging technologies provide an improved quality of life</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td></td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>Technology increases my mobility</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td></td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>Technology offers greater control of the day-to-day life affairs</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td></td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>Adoption of technology has enhanced my productivity in my personal</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>life</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>People consult me on the use of new technologies</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td></td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>On average, I am among the foremost persons in my social circles to</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>know about the emerging technologies</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>Ordinarily, I can know how to use techno-savvy services and products</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>without much assistance</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>I am informed of the emerging technological advancement in my field</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>of interest</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>In the instances when I get technical assistance from a specialist</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>in hi-tech products or services, at times I feel as if I am</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>being exploited since the person may know more than I do</td>
<td></td>
</tr>
<tr>
<td>Technical support calls do not add the intended value as they use</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>complex language that I cannot comprehend</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>At times, I am of the opinion that technology is not a system for</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>the ordinary people</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>The manuals for the hi-tech products or services are not written in</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>standard and simple language</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>The people are over-reliant on technology to work for them</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td></td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>Extreme technology diverts people to a dangerous extent</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td></td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>Technology degrades the value of relationships through reduced</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>personal relations</td>
<td>Colby (2015)</td>
</tr>
<tr>
<td>I am in doubt to deal with an organization that can only be reached</td>
<td>Parasuraman and</td>
</tr>
<tr>
<td>via an online channel</td>
<td>Colby (2015)</td>
</tr>
</tbody>
</table>

6.4.2.2 Construct: Top Management Support

The literature on top management offers ample evidence for the key role of top management support in the success of almost all programmes and processes within an organisation (Jex and Britt 2014, Rodgers, Hunter and Rogers 1993). Top management support and commitment to change play a key part in organisational renewal as senior
managers can mobilise the critical mass, and continuously support the efforts necessary for the success of a programme (Enofe et al. 2013). The items used to measure the construct top management support are provided in Table 6.2. These were adopted from Lewis, Pan and Lalla (2007) and Cohen and Sayag (2010).

**Table 6.2 Items for Construct Top Management Support**

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>My organisation identifies employee needs for recognition, work satisfaction, competence and personal development</td>
<td>Lewis, Pan and Lalla (2007)</td>
</tr>
<tr>
<td>Top management ensures the proficiency of auditors in my organisation is sufficient in developing the skills required for computer assisted auditing</td>
<td>Lewis, Pan and Lalla (2007)</td>
</tr>
<tr>
<td>Top brass of the organisation manage the finances required to maintain an efficient audit to enhance the firm to fulfil the set objectives.</td>
<td>Lewis, Pan and Lalla (2007)</td>
</tr>
<tr>
<td>Top management in my organisation plans to implement new technology for internal auditing</td>
<td>Lewis, Pan and Lalla (2007)</td>
</tr>
<tr>
<td>Top management in my organisation denies me the standard support that I expect</td>
<td>Cohen and Sayag (2010)</td>
</tr>
<tr>
<td>Top management in my organisation is inadequately conscious of the needs of an internal auditor, as evident by the minimal finances allocated to my department</td>
<td>Cohen and Sayag (2010)</td>
</tr>
<tr>
<td>Top management in my organisation does not motivate the training and developing the internal auditors</td>
<td>Cohen and Sayag (2010)</td>
</tr>
</tbody>
</table>

**6.4.2.3 Construct: Pressure from Management**

Griffith, Hammersley and Kadous (2015) found that excessive pressure from management can adversely affect the performance of auditors. To make critical decisions, auditors must be free from management pressure (Griffith et al. 2015). Items in Table 6.3 were adopted from Svanberg and Ohman (2013). Svanberg and Öhman (2013) examined the ethical culture in an organisation that can result in management pressure and its effect on audit quality. Since Svanberg and Öhman (2013) provide information necessary to measure the
different forms of pressure that can influence internal auditors, their study was considered appropriate for the purpose of developing the items for the pressure from management construct in this study. Increased pressure from management can increase the work demands of internal auditors and result in a deterioration in audit quality (Svanberg and Öhman 2013). The pressure factors that influence audit quality were also adopted from the Svanberg and Öhman (2013) study to measure the internal auditor's perception of the influence of management pressure in an internal audit environment. Table 6.3 provides the items used for the pressure from management construct.

Table 6.3 Items for Construct Pressure from Management

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top management in my organisation represent high audit standards</td>
<td>Svanberg and Öhman (2013)</td>
</tr>
<tr>
<td>Top management in my organisation regularly show that they care about audit work</td>
<td>Svanberg and Öhman (2013)</td>
</tr>
<tr>
<td>Internal auditors in my organisation are expected to do as they are told</td>
<td>Svanberg and Öhman (2013)</td>
</tr>
<tr>
<td>The boss is always right in my organisation</td>
<td>Svanberg and Öhman (2013)</td>
</tr>
<tr>
<td>Ethical behaviour is the norm in my organisation</td>
<td>Svanberg and Öhman (2013)</td>
</tr>
</tbody>
</table>

To offer a holistic view of the aspects impacting CAAT adoption intention, the next section examines the influence of environmental factors.

6.4.3 Section Three: Environmental Profile

Section Three of the questionnaire was used to assess various environmental factors that influence the internal auditor’s intention to adopt CAATs. These are time pressure and audit independence. Accordingly, this section explains the constructs time pressure and audit independence, along with the items used to measure these constructs.
6.4.3.1 Construct: Time Pressure

Auditors encounter a shared challenge of operating under a fixed budget. The origins of this challenge can be traced back to the bidding procedure used to win audit contracts (McDaniel 1990). Tight time budgets in an audit context are a major barrier to high quality audits (Svanberg and Öhman 2013). To measure time pressure in an internal audit environment, all the items for this construct were adopted from a study undertaken by Azad (1994). Azad (1994) specifically examined internal auditors’ time pressure on their resultant behaviour. Time budget pressure has serious adverse consequences on the behaviour of auditors. Table 6.4 shows the nine items used to measure the construct time pressure. Because the study by Azad (1994) considered different aspects of time pressure in an internal audit context, those items were considered appropriate for the time pressure construct in this study.

Table 6.4 Items for Construct Time Pressure

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time budgets are now more rigid in modern practice</td>
<td>Azad (1994)</td>
</tr>
<tr>
<td>Internal audit personnel at times work from their homes without indicating the time used so that they may be in a position to work within the set timelines</td>
<td>Azad (1994)</td>
</tr>
<tr>
<td>Re-evaluation processes in my department can fairly be used to unearth early sign-offs on audits</td>
<td>Azad (1994)</td>
</tr>
<tr>
<td>There is a natural conflict between the concept of a time budget and the gathering of sufficient competent evidential matter</td>
<td>Azad (1994)</td>
</tr>
<tr>
<td>When the time budget is exceeded in one phase of an audit, the internal auditor feels a need to save time elsewhere</td>
<td>Azad (1994)</td>
</tr>
<tr>
<td>The time budget is a necessary management tool for the evaluation of an internal auditor</td>
<td>Azad (1994)</td>
</tr>
<tr>
<td>The time budget greatly determines internal auditor’s work</td>
<td>Azad (1994)</td>
</tr>
<tr>
<td>The carrying out of a precise audit practice is a basic role of the internal auditor performing that procedure</td>
<td>Azad (1994)</td>
</tr>
<tr>
<td>The auditor’s professional judgement is always sufficient to overrule the performance of a specific audit step</td>
<td>Azad (1994)</td>
</tr>
</tbody>
</table>
6.4.3.2 Construct: Audit Independence

A presumption that auditors act independently enhances the integrity of the results they deliver (Beattie, McInnes and Fearnley 2004). While many researchers have examined independence of the auditors, this has largely fallen within the purview of external auditing (Bamber and Iyer 2007, Reynolds, Deis Jr and Francis 2004). The recent past has seen an increase in interest in matters concerning independence and impartiality of the internal audit function (Ahlawat and Lowe 2004). The study by Christopher, Sarens and Leung (2009) provided an important assessment of the role of independence in the context of internal audit by specifically examining different components of internal auditor independence, thereby making it particularly suitable for examining the independence of the internal auditors in this study. Accordingly, items for the audit independence construct as detailed in Table 6.5 were adopted from Christopher, Sarens and Leung (2009).

Table 6.5 Items for Construct Audit Independence

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>The internal audit function in Omani state organisations is independent of the management of the organisations they audit</td>
<td>Christopher, Sarens and Leung (2009)</td>
</tr>
<tr>
<td>The internal audit function in Omani state organisations approves their own annual operations budget</td>
<td>Christopher, Sarens and Leung (2009)</td>
</tr>
<tr>
<td>Internal auditors in Omani state organisations perform follow-up assessment to establish if management acted in accordance with the recommendations</td>
<td>Christopher, Sarens and Leung (2009)</td>
</tr>
<tr>
<td>It is common for internal auditors to move to other functions within Omani state organisations</td>
<td>Christopher, Sarens and Leung (2009)</td>
</tr>
<tr>
<td>Internal auditors agree with managers of the organisations they audit the purpose of their investigation before commencing their work</td>
<td>Christopher, Sarens and Leung (2009)</td>
</tr>
<tr>
<td>Internal auditors file written reports on issues raised</td>
<td>Christopher, Sarens and Leung (2009)</td>
</tr>
<tr>
<td>Internal auditors report to an advanced level in the organisation if administration does not offer a response</td>
<td>Christopher, Sarens and Leung (2009)</td>
</tr>
</tbody>
</table>
The following section focuses on the technological profile of individuals involved in the audit process.

**6.4.4 Section Four: Technological Profile**

Section Four of the questionnaire examined the technological profile and the internal auditor’s perception of the technological benefits and technological risks associated with the adoption of CAATs for internal audit purposes. The following sub-sections explain the constructs technological benefits and technological risks along with the items used to measure both constructs.

**6.4.4.1 Construct: Technological Benefits**

The growing complexity of technology and the continuous digitisation of business have changed the approach to business (Vasarhelyi and Romero 2014). In the modern technological age, there is an increased risk of misuse of accounting information systems and this has resulted in the need for audit organisations to acquire the technical skills and analytical capacities to build up specialised teams that can effectively use computer systems for audit engagements (Vasarhelyi and Romero 2014).

Items for this particular construct were adopted from Braun and Davis (2003) who evaluated CAATs such as integrated test facilities (ITF) and embedded audit modules in relation to their benefits from the perspective of internal auditors. Other studies have examined the potential long-term benefits originating from CAAT application, but not from the perspective of internal auditors (Curtis and Payne 2008, Debreceny et al. 2005). Since the aim of this research is to assess the internal auditor’s perception of technology
benefits, the items for this construct were developed from Braun and Davis (2003). Table 6.6 provides the items used for the technology benefits construct.

**Table 6.6 Items for the Construct Technological Benefits**

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would be capable of finalizing the audit processes in a more effective manner using CAATs</td>
<td>Braun and Davis (2003)</td>
</tr>
<tr>
<td>I would focus more on the representative samples, and less on high risk samples if I could use CAATs</td>
<td>Braun and Davis (2003)</td>
</tr>
<tr>
<td>Using CAATs would improve overall audit effectiveness</td>
<td>Braun and Davis (2003)</td>
</tr>
<tr>
<td>Using CAATs would increase the likelihood of referrals to an investigations team</td>
<td>Braun and Davis (2003)</td>
</tr>
<tr>
<td>I would be inclined in taking part in more CAATs training if it was available</td>
<td>Braun and Davis (2003)</td>
</tr>
</tbody>
</table>

**6.4.4.2 Construct: Technological Risks**

The potential technological risks that may arise from the use of CAATs typically emerge from its improper use (Doligalski 2015). Improper use of CAATs may result in audit inaccuracy (Rosli et al. 2012). Items for this construct were also adopted from Braun and Davis (2003). Braun and Davis (2003) examined the internal auditor’s perception of technology risks insofar as they relate to the incorporation of technology for the purpose of internal auditing. Hence, the study by Braun and Davis (2003) was considered suitable for examining the internal auditor’s perception of technology risks in this research study. Table 6.7 provides the items for the technological risks construct.
Table 6.7 Items for the Construct Technological Risks

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would expect to encounter system challenges (e.g. lockouts, connection issues among others) that would impair the effectiveness of my audit work</td>
<td>Braun and Davis (2003)</td>
</tr>
<tr>
<td>I would expect to encounter significant CAAT-related problems on my audits if used</td>
<td>Braun and Davis (2003)</td>
</tr>
<tr>
<td>What would you say on the impact of embodying CAATs in your organisation? (Important risk – Inconsequential risk)</td>
<td>Braun and Davis (2003)</td>
</tr>
<tr>
<td>How would you characterise the decision to use CAATs in your internal audit work?</td>
<td>Braun and Davis (2003)</td>
</tr>
<tr>
<td>What would you say on the impact of embodying CAATs in your organisation? (High potential for loss – High potential for gain)</td>
<td>Braun and Davis (2003)</td>
</tr>
</tbody>
</table>

6.4.5 Section Five: Individual Profile

Section Five of the questionnaires examines the individual profile of the participants which affects the internal auditor’s intention towards adopting CAATs. The individual profile is measured using constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions. This section explains the four constructs relevant to the individual profile and the items used to measure these constructs.

6.4.5.1 Construct: Performance Expectancy

Under the UTAUT, performance expectancy acts as a variable that forecasts the positive interplay between the intention towards the use of technology and performance (Venkatesh et al. 2003). Assessing the auditor’s output is a difficult task that includes budget attainment and standard of the audit (Hunt 1995). Audit technology can enhance effectiveness of audits, although only in the long-run (Curtis and Payne 2014). All items for this construct were adopted from Curtis and Payne (2014), and Bierstaker, Janvrin and Lowe (2014). The study by Curtis and Payne (2014) contains items to measure the influence of performance expectancy on technology utilisation decisions in an external auditing context. Given that the study by Curtis and Payne (2014) considered an external...
audit context, the study by Bierstaker et al. (2014) was also used to develop the items to measure performance expectancy for this study because they examined the internal auditor’s perception of the impact of CAATs on their performance. Curtis and Payne (2014) and Bierstaker et al., (2014) examined the role of UTAUT in the audit context and so, the components used to measure performance expectancy in both of these studies are considered suitable for inclusion in this current study. Table 6.8 shows the constructs of performance expectancy.

Table 6.8 Items for Construct Performance Expectancy

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would find CAATs helpful in my work</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>Using technology would make me quicker in doing various tasks at work</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>Using CAATs would increase my productivity</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>If I used CAATs, I would potentially enhance my probability of getting a higher pay</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>By using CAATs I would spend less time on routine tasks and unproductive activities</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>Using CAATs would enhance enable me to deliver more quality output</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
</tbody>
</table>

6.4.5.2 Construct: Effort Expectancy

Effort expectancy may be defined as the simplicity associated with the application of a technology (Venkatesh et al. 2003). In the area of internal audit, effort expectancy is measured in terms of the perceived difficulty and complexity associated with technology adoption, and the effort and audit hours required to adopt that technology (Curtis and Payne 2014). All items for this construct as shown in Table 6.9 were adopted from Curtis and Payne (2014), and Bierstaker, Janvrin and Lowe (2014). Curtis and Payne (2014) and Bierstaker et al., (2014) examined the effort expectancy component of the UTAUT in an
internal audit context, and as a result, these specific items were considered suitable for use in this research. The study by Curtis and Payne (2014) provided a validated scale which includes the measurement of effort expectancy in technology adoption, whilst the study by Bierstaker et al., (2014) specifically examined the different components of CAATs which influence effort expectancy. Hence, the items for the effort expectancy construct in Table 6.9 were integrated from the studies undertaken by both Curtis and Payne (2014) and Bierstaker et al., (2014).

Table 6.9 Items for the Construct Effort Expectancy

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>It would be easy for me to become skilful in using CAATs</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>I find would CAATs easy to use</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>Learning to use CAATs would be simple for me</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>Using CAATs may require a great intellectual input</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
</tbody>
</table>

6.4.5.3 Construct: Social Influence

The social influence predictor in the UTAUT reflects an individual’s insight to the opinions of their peers, their reference to the tendency of a collective bias, precise interpersonal contracts with their peers, and the level to which the application of an innovation is anticipated to empower one's image or status in a social set up (Venkatesh et al. 2003). Items for the social influence construct in Table 6.10 were adopted from Curtis and Payne (2014), and Bierstaker, Janvrin and Lowe (2014). The studies performed by Curtis and Payne (2014), and Bierstaker, Janvrin and Lowe (2014) examined the different components of social influence using the UTAUT. The UTAUT was modified by Bierstaker et al., (2014) to suit the audit context, and the items for social influence were
developed to measure its influence on the internal auditor’s intention to adopt CAATs. Although Curtis and Payne (2014) do not specifically provide items to measure the impact of social influence on the internal auditor's intention to adopt technology, that study assessed the impact of social influence on technology adoption. The studies by Curtis and Payne (2014), and Bierstaker et al., (2014) measured different social factors and their influence on the internal auditor’s adoption of CAATs. Hence, items from both studies were integrated in the current study to measure the influence of social factors on the internal auditor’s intention to adopt CAATs. Table 6.10 shows the constructs of social influence.

**Table 6.10 Items for Construct Social Influence**

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>People who weigh in on my character hold the view that I should adopt CAATs</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>The people whom I hold with high regard believe that I should use CAATs</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>Senior management in my organisation would be helpful to me in using CAATs</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>In general, my organisation would support the use of CAATs as they probably would want me to use CAATs</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>My manager would be very supportive of the application of CAATs for my job</td>
<td>Curtis and Payne (2014) &amp; Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
</tbody>
</table>

**6.4.5.4 Construct: Facilitating Conditions**

Facilitating conditions refer to the degree to which an individual considers that the organisation and technological infrastructure is available to enhance his or her use of an item (Venkatesh et al. 2003). In this context, the infrastructure may include the firm’s
provision of sufficient CAAT and IT support to the employees. Such infrastructure includes specialised instruction, support centre hotlines and user guidelines (Thompson, Higgins and Howell 1991). The facilitating conditions construct for this study was measured using four items adopted from Bierstaker et al., (2014), and Curtis and Payne (2014). The validated scale developed to measure technology adoption in an external audit context using the UTAUT developed by Curtis and Payne (2014) included items to measure facilitating conditions. The study by Bierstaker et al., (2014) provided a detailed description of different components of CAATs for internal auditing. Hence, the items used in both studies on facilitating conditions are considered suitable for this research. Table 6.11 shows the items employed in the assessment of the facilitating conditions construct.

Table 6.11 Items for Construct Facilitating Conditions

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can easily access the resources needed in the effective use of CAATs</td>
<td>Curtis and Payne (2014)</td>
</tr>
<tr>
<td></td>
<td>Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>I possess the expertise to use CAATs</td>
<td>Curtis and Payne (2014)</td>
</tr>
<tr>
<td></td>
<td>Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>In all likelihood, CAATs would not be compatible with other systems I use</td>
<td>Curtis and Payne (2014)</td>
</tr>
<tr>
<td></td>
<td>Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
<tr>
<td>Assistance would be accessible for IT system challenges if I used CAATs</td>
<td>Curtis and Payne (2014)</td>
</tr>
<tr>
<td></td>
<td>Bierstaker, Janvrin and Lowe (2014)</td>
</tr>
</tbody>
</table>

The sixth section of the questionnaire focused on audit quality, which forms the basis of the second conceptual framework developed in this study.

6.4.6 Section Six: Audit Quality

Section Six of the questionnaire examines audit quality. The audit quality construct in
Table 6.12 was measured by six items in respect of which the internal auditor’s opinion was sought on whether they approved or disapproved. The items for this construct were taken from a study performed by Cohen & Sayag (2010). The Cohen and Sayag (2010) study, which focused on internal audit effectiveness, measured internal audit quality. Cohen and Sayag (2010) specifically assess the aspects that influence internal audit quality in both the private and public sectors. Accordingly, the factors identified in the study undertaken by Cohen and Sayag (2010) were adopted in this study to measure the internal auditor's perception of audit quality. Since there are very few previous studies which examine internal audit quality, the factors used by Cohen and Sayag (2010) were considered suitable. Table 6.12 shows the items for the audit quality construct.

Table 6.12 Items for Construct Audit Quality

<table>
<thead>
<tr>
<th>Items</th>
<th>Literature Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>The yearly audit plan is wholly determined by the audit director</td>
<td>Cohen and Sayag (2010)</td>
</tr>
<tr>
<td>The areas audited are hugely important to the firm</td>
<td>Cohen and Sayag (2010)</td>
</tr>
<tr>
<td>Internal auditors are in a position to assess all organisational sections and aspects</td>
<td>Cohen and Sayag (2010)</td>
</tr>
<tr>
<td>The response of audited organisations to the audit is submitted in writing to the head of audit, and is relevant and comprehensive</td>
<td>Cohen and Sayag (2010)</td>
</tr>
<tr>
<td>The internal auditor still undertakes a variety of actions such as establishing processes and fiscal audits</td>
<td>Cohen and Sayag (2010)</td>
</tr>
<tr>
<td>There is a consistent review by the audit manager to assess the undertakings embraced to help establish solutions</td>
<td>Cohen and Sayag (2010)</td>
</tr>
</tbody>
</table>

The next section details the hypotheses developed for the second theoretical framework to measure the impact of technology adoption on internal audit quality.
6.5 Hypotheses Development: Audit quality Framework

The second conceptual framework developed in this study namely, the Audit Quality Framework, aims to explain the influence of factors underpinning the relationship between technology adoption and audit quality. Achieving a high quality audit is one of the primary goals of internal auditors (van Haagen 2016). Adoption of technology based audits can enhance the performance of auditors through reducing the likelihood of material errors (van Haagen 2016). Audit technology has become an essential tool to assist auditors in the effective completion of audit tasks (Rosli et al. 2012). Banker, Chang and Kao (2002) state that the adoption of audit technology can enhance the performance and productivity of auditors, thereby improving audit quality.

Performance expectancy is defined as the degree to which auditors perceive that the adoption of audit technology will increase their performance (Venkatesh et al. 2003). Performance expectancy is an important determinant of consumer acceptance of technology (Mansour 2016). Studies demonstrate that audit technology increases audit efficiency and enhances auditor performance by enabling them to execute tasks which may not be possible using only manual audit techniques (Mahzan and Lymer 2012; Paukowits 2000; Hudson 1998). The positive association between auditors’ performance expectancy and technology adoption is well established in the literature (Mahzan and Lymer 2014, Rosli et al. 2012). This leads to the following hypothesis of the audit quality framework:

**Hypothesis 12: The higher the level of performance expectancy, the higher the level of audit quality perceived by internal auditors**
Reducing the time pressure associated with auditing is a major determinant of the auditor’s intention to adopt technology (Smidt et al. 2014). Bierstaker, Burnaby and Thibodeau (2001) observe that audit technology allows auditors to satisfy the demands of clients in a timely manner using reliable audit procedures. Thus, technology adoption allows auditors to produce faster results for audit clients in a reliable manner, thereby ensuring audit quality. Thus, the next hypothesis of this model is as follows:

**Hypothesis 13: The lower the level of time pressure, the higher the level of audit quality perceived by internal auditors**

Auditors have a responsibility to meet the expectations of their superiors (Mariaka, 2012). When auditors are under immense pressure from management, they develop an aversion towards adopting technology (Janvrin et al. 2008). Such an approach may adversely affect the productivity of internal auditors (Mariaka 2012). Studies show that pressure from management has a significant impact on the auditor’s intention to accept technology (Griffith et al. 2015, Svanberg and Öhman 2013). Svanberg and Ohman (2013) found that higher pressure from management to increase audit quality negatively affects the internal auditor’s intention to adopt technology. Accordingly, the next hypothesis of this model is as follows:

**Hypothesis 14: The lower the level of pressure from management, the higher the level of audit quality perceived by internal auditors**

Audit independence is acknowledged to motivate auditors to adopt technology (Sun 2012). This is because audit technology allows internal auditors to effectively manage risk and
operate with trust and integrity (Bédard et al. 2008). Studies indicate that auditors who are independent are more inclined to adopt technology due to its positive impact on audit quality (Moorthy et al. 2011, Sun 2012). Thus, the next hypothesis of this model is as follows:

**Hypothesis 15: The higher the level of audit independence, the higher the level of audit quality perceived by internal auditors**

Top management support is identified as a significant determining aspect in technology adoption (Sun 2012, Rosli et al. 2012). Auditors with better top management support are considered more likely to adopt audit technology. Krohmer and Noel (2010) note that top management support in the form of better leadership, can positively contribute towards audit quality in audit firms. Thus, the next hypothesis of this model is as follows:

**Hypothesis 16: The higher the level of top management support, the higher the level of audit quality perceived by internal auditors**

One of the primary functions of internal auditors is to ensure high audit quality. High audit quality refers to the internal auditor’s ability to uncover material errors and misstatements (DeAngelo 1981). High quality internal audits can allay investor concerns and achieve the audit objectives. Adopting technology based auditing is acknowledged to improve audit efficiency and audit quality because it provides more timely information which is accurate and verifiable, compared to the traditional manual internal audit (O’Donnell 2010). David and Steinbart (2000) argue that technology adoption improves audit quality by reducing the time spent by internal auditors in accessing and analysing data. Omaonuk and Onu
(2015) examined the use of CAATs on the quality of internal audits in Nigeria, and found that the impact of adopting CAATs on the internal audit value depends on its effective implementation. Accordingly, the next hypothesis of this model is as follows:

**Hypothesis 17: The higher the level of CAAT adoption, the higher the level of audit quality perceived by internal auditors**

The next section explains the methods and techniques used for the pilot survey.

6.6 Pilot Survey

A pilot survey was conducted in order to streamline the process of actual data collection based on what was learned from the pilot exercise. To this end, the questionnaire was translated into Arabic as this is the native language of the respondents. However, the responses received were subsequently translated into English for the purposes of this thesis. The researcher contacted available experts to ensure that the responses were not distorted by the translation (Douglas and Craig 1983).

6.6.1 Test of Survey Instrument

The pilot study was performed shortly after finalising the quantitative survey instrument. The respondents for the pilot study were selected using purposive sampling. Purposive sampling is widely used in pilot studies because collecting data from information rich samples is considered effective in examining the feasibility of the research design (Bernard and Bernard 2012), and for testing the reliability of the research instrument prior to undertaking a larger project (Palinkas et al. 2015). A total of 15 respondents participated in the pilot study. Five internal auditors from each of the three public audit organisations in Oman were selected to ensure all three organisations were represented.
The questionnaires were distributed by hand for the pilot study in order to examine the feasibility of the hand distribution method and the subsequent response rate. The quality of the questionnaire was assessed for the presence of ambiguous questions. Ambiguous questions are questions that are difficult to understand, or are not clear (Van Teijlingen et al. 2001). The respondents were asked to report their views about the questionnaire, including the comprehensiveness and completeness of the questions asked, difficulties experienced in answering the questions, and any other views they held concerning the structure of the questionnaire. The key issue identified at this stage of the process centred on the risk of the questionnaire being ignored, and not being completed by the respondents. Incomplete questionnaires and unreturned questionnaires can increase non-response bias in studies (Sivo et al. 2006). To this end, steps were factored in to address this issue such as issuing reminders to the respondents by phone to complete the survey.

According to Lodico, Spaulding and Voegtle (2010), a pilot study offers the researcher the opportunity to conduct a test run of the quantitative survey to ensure that weaknesses in it are identified and addressed. In particular, it offers the researcher a chance to determine factors including the adequacy of the instructions in the survey, the appropriateness of the research instrument, the feasibility of a full-scale survey, the effectiveness of the questionnaire distribution technique, the extent of resources needed for the full-scale survey, the sensitivity of participants to different questions, and the average time required to complete the survey (Hertzog 2008; Thomas, Nelson and Silverman 2011; van Teijlingen and Hundley 2001). Sensitive questions in this context include personal questions, invasive questions, questions that trigger concerns regarding social desirability and questions that make the participants feel uneasy and which may raise concerns
concerning the possible consequences of disclosing information. These may cause participants to give expected or biased responses rather than sharing their actual personal opinions (Tourangeau and Yan 2007). Sensitivity reduction techniques employed for this research included guaranteeing the anonymity of the respondents and the using self-administered questionnaires (Kaplan and Yu 2015). Self-administered questionnaires are questionnaires that are completed by the respondents themselves (Sudman, Greeley and Pinto 1965). The questionnaire was largely viewed by the participants as comprehensive and understandable. Accordingly, no changes were made to the survey instrument after conducting the pilot study. The next section details the data collection method used for the main quantitative survey used for this study.

6.7 Data Collection
The population for the main research study consisted of internal auditors from the three public audit organisations in Oman namely, the Royal Court Affairs (RCA), the Royal Army of Oman (RAO), and the State Audit Institution (SAI). Since representativeness of the population was considered important, a purposive sampling method was adopted for the main quantitative survey (Center for Innovation in Research and Teaching (CIRT) 2016). Senior management within the three audit institutions were contacted to establish how many internal auditors worked in those organisations. The total population of auditors amounted to 950. Based on discussions with senior management, it was established that approximately 800 auditors would be working in the three organisations at the time the survey instrument was to be distributed. The remaining 150 auditors were expected to be absent owing to factors such as annual leave, or because they would be out of the office on field audits. Accordingly, 800 questionnaires were to be distributed. Due to legal restrictions on access by non-specialists to some of the research sites (SAI and RAO),
personal contacts agreed to circulate the questionnaires. As a member of the RCA internal audit team, access to the RCA proved easier. The respondents were given one month to complete and return their questionnaires. After two weeks had passed, a reminder was issued by internal e-mail by key contacts on behalf of the researcher. This reminder e-mail stated the number of days remaining to close the survey. The following section details the process involved in calculating the sample size for Phase 2 of this study.

6.7.1 Calculating the Sample Size

An appropriate sample size is calculated by reference to two variables namely, (1), the standard error estimation using an acceptable margin of error and alpha level, and (2), variance estimation (Bartlett 2001). The acceptable margin of error is based on the nature of the variables in the questionnaire (Bartlett 2001). When the standard error is set to be a low percentage, the sample size can result in greater statistical power and reduced overlap (Scherbaum and Ferreter 2009). Because the primary variables for this research are ordinal, with a seven point Likert scale, a 5% margin of error was considered acceptable (Bartlett 2001). Variance estimation is also based on whether the primary variables of the study are ordinal or ratio. Because the primary variables were measured on a seven point scale (ordinal), the maximum standard deviation allowed is four, being two to each side of the mean (Bartlett 2001). Then the estimated standard variation is arrived at after dividing the points on the scale by the maximum standard deviation on the scale as follows:

\[
Sample Size = \frac{z^2 \times p(1-p)}{e^2} \div \frac{z^2 \times p(1-p)}{e^2N}
\]

The main variables of the formula provided are as follows:

\[
N = \text{population size}
\]
p = response parameter, which is normally set at 0.5 e = error rate

\[ Z = z\text{-score based on confidence level needed} \]

The population size of internal auditors in the three public audit organisations in Oman is approximately 800, based on discussions with senior management. The value of p, the response parameter is set at 0.50, and the error rate is normally taken at 0.05 (Bartlett 2001). As the confidence interval is taken at 95%, the z-score is 1.96. The sample size calculation for this research is 259.56, which is rounded to 260.

Based on this calculation, the acceptable sample size suitable for this research that can ensure the quality and accuracy of the research is 260 or more. Scherbaum and Ferreter (2009) suggest that the sample size used in organisational research is a major determinant of the statistical power of quantitative research. Statistical power refers to the probability of detecting an effect when it exists (Scherbaum and Ferreter 2009). Thus, the sample size selected for this study is considered appropriate for ascertaining whether there is any significant relationship in the variables tested. The next section explains the work involved in analysing the data received during this Phase 2 of the research process.

6.7.2 Initial Data Analysis

The quantitative data analysis phase commenced with descriptive statistical analysis. The questionnaire response rate stands at 44.38% based on 355 responses. This rate is considered excellent given that standard response rates average approximately 20% (Curtis and Payne 2006). Descriptive statistics provide an understanding of the basic distribution of the data by summarising the data collected from the participants (Goodwin 2009). The measure of central tendency and the measure of dispersion of the variables facilitate an understanding of the data (Goodwin 2009). A measure of central tendency determines the
mid-point of distribution of the data which principally includes the mean, the median and the mode (Lee et al. 2001). Central tendency alone cannot explain a sample or population of study as it is only an aggregate number, and the variation in the data is not provided. A measure of dispersion refers to the variation in the data, and includes measures such as the range and standard deviation (Graham, 2008).

Following the descriptive statistical analysis phase, inferential statistical analysis using advanced statistical analysis including factor analysis and regression was performed. Inferential statistical analysis is used to draw conclusions from the data collected (Goodwin 2009). While the function of descriptive statistics is to summarise, organise, and display the data, inferential statistics allows one to analyse the data collected, test the hypotheses, and draw conclusions from the data (Asadoorian and Kantarelis 2005). When there are hypotheses developed from the literature, inferential statistical analysis allows the testing of these hypotheses, by examining relationships between variables. The following sub-sections provide the results from undertaking the descriptive statistical analysis of the questionnaires.

### 6.7.2.1 Age and Gender

It has been suggested that key characteristics associated with technology adoption such as the age and gender of individuals are important in determining their attitude towards the adoption of new technology (Sanchez-Franco, Ramos, & Velicia 2009). Research suggests that older employees in particular, may be extra conventional and opposed to risk compared to their younger counterparts, thus lowering the probability of them adopting a new technology such as CAATs (Weltevreden & Boschma 2008). Table 6.13 provides the
demographic distribution of the respondents who participated in the main quantitative survey.

**Table 6.13 Respondent Demographics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Category</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td>Male</td>
<td>226</td>
<td>63.7</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>129</td>
<td>36.3</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td>22 – 24 years</td>
<td>56</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>25 – 34 years</td>
<td>176</td>
<td>49.6</td>
</tr>
<tr>
<td></td>
<td>35 – 44 years</td>
<td>91</td>
<td>25.6</td>
</tr>
<tr>
<td></td>
<td>45 – 54 years</td>
<td>27</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>More than 55</td>
<td>5</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>Job title (excluding ‘other’)</strong></td>
<td>Audit manager</td>
<td>23</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>Team leader</td>
<td>37</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>First auditor</td>
<td>91</td>
<td>25.6</td>
</tr>
<tr>
<td></td>
<td>Auditor</td>
<td>109</td>
<td>30.7</td>
</tr>
<tr>
<td></td>
<td>Audit assistant</td>
<td>84</td>
<td>23.7</td>
</tr>
<tr>
<td><strong>Highest academic qualification</strong></td>
<td>None</td>
<td>27</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>Diploma</td>
<td>65</td>
<td>18.3</td>
</tr>
<tr>
<td></td>
<td>Degree</td>
<td>222</td>
<td>62.5</td>
</tr>
<tr>
<td></td>
<td>Masters</td>
<td>41</td>
<td>11.5</td>
</tr>
</tbody>
</table>
As per Table 6.13, the majority of the survey respondents were male (63.7%). Li, Glass and Records (2008) found that gender is not a major determining factor in the adoption and usage of new technology, as they found a similar adoption rate among male and female respondents. Their study examined the adoption rate of m-commerce for students joining a business institution in the North-Eastern region of the United States (US). Similarly, the study conducted by Davison and Argyriou (2016) on graduate and undergraduate students in an Indiana research and teaching university, found that there is no significant difference in technology adoption among male and female students. Venkatesh and Davis (2000) note that gender has an indirect influence on the technology adoption decision of internal auditors. A study by Venkatesh, Morris and Ackerman (2000) found that while men are more influenced by their personal attitude and individual evaluation of technology, women are more influenced by the subjective norm (Venkatesh et al. 2000). Subjective norm signifies the expected social pressure associated with the commission or omission of a specified behaviour (Ajzen & Madden 1986). In the context of technology adoption, subjective norm refers to peer and or supervisor influence (Venkatesh & Davis 2000).

Although people from all age groups increasingly use technology in different areas of their employment, studies show that older employees in particular experience difficulty in learning, using, and operating modern technologies (Czaja et al. 2006). The study by Wasiluk (2013) found that a higher proportion of employees in the 55 years and above age group inhibit the rate of innovation and adoption of new technologies in their organisations. Wasiluk (2013) also noted that employees up to the age of 49 years are open to adopting emerging technologies. In the current research study, a significant majority of the respondents (91%) were below the age of 45. Because the sample selected for this survey is representative of the population, this suggests that most of the employees across the three
public audit organisations in Oman are below the age of 45. This is the age group that is regarded as appropriate for adopting new technologies (Wasiluk 2013). To confirm that the respondents who participated in the survey were indeed representative of the entire population; three contacts from the SAI, RCA and ROA were forwarded this basic demographic information obtained from the surveys. These contacts confirmed that there was a higher proportion of male than female internal auditors, and that a majority of the employees were within the 25-40 age group in the SAI, the RCA and the audit department of the RAO.

6.7.2.2 Respondent Job Profiles

The data collected about respondent job profiles included job titles, number of years’ experience, and knowledge level. As per Table 6.13, 6.5% of the respondents identified themselves as audit managers, 13.5% identified themselves as audit team leader, 25.6% as first auditor, 30.7% as auditor, and 23.7% as audit assistant. In terms of academic qualifications, the majority of the respondents held a masters, degree, or diploma, whilst 7.7% of the respondents held no major academic qualification. Studies show that highly educated workers have a greater probability of embracing emerging technology faster relative to those with minor levels of education (Lleras-Muney & Lichtenberg 2002; Riddell & Song 2012). Education plays an important role in determining the desire to embrace and adopt emerging technology. The higher the level of education, the higher the chance a person’s intention will be to adopt technology, since education increases the probability of higher exposure to technology (Riddell & Song 2012). Accordingly, educated people are more likely to use computers and similar technology in performing their work compared to people who are less educated (Riddell & Song 2012). Experience
in using technology by educated people is one reason for the positive association between education and technology adoption (Riddell & Song 2012).

6.7.2.3 Audit Organisation Information

Table 6.14 presents information about the three audit organisations that the respondents work in. These three audit organisations have a total of six internal audit departments. There are two internal audit departments in the RCA, one in the RAO, and three in the SAI. The main organisation factors identified included level of experience which was measured as number of years’ spent in the current organisation and in the audit field; number of people on the audit team; and IT training received.

In terms of the number of years’ experience in their current organisation, the majority of the respondents (59.7%) confirmed that worked in their respective audit organisations for less than 9 years. 36.1% of the respondents had between 10 and 19 years’ experience in their respective organisations, whilst the remaining 4.2% had 20 or more years’ experience in their organisations. The majority of the respondents (74.4%) worked on teams comprised of less than 10 members. As regards training in technology, only 21.7% of the respondents reported undertaking technology training courses within the previous three months, whilst the remaining 78.3% reported not receiving any form of technology training in that timeframe.
Table 6.14 Audit Organisation Information

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Place of work</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Royal Court Affairs (1)</td>
<td>48</td>
<td>13.5</td>
</tr>
<tr>
<td>Royal Court Affairs (2)</td>
<td>28</td>
<td>7.9</td>
</tr>
<tr>
<td>Royal Army of Oman (3)</td>
<td>82</td>
<td>23.0</td>
</tr>
<tr>
<td>State Audit Institution (4)</td>
<td>13</td>
<td>3.7</td>
</tr>
<tr>
<td>State Audit Institution (5)</td>
<td>19</td>
<td>5.4</td>
</tr>
<tr>
<td>State Audit Institution (6)</td>
<td>165</td>
<td>46.5</td>
</tr>
<tr>
<td><strong>Years’ of work experience in current organisation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5</td>
<td>102</td>
<td>28.7</td>
</tr>
<tr>
<td>5-9 years</td>
<td>110</td>
<td>31.0</td>
</tr>
<tr>
<td>10-14 years</td>
<td>84</td>
<td>23.7</td>
</tr>
<tr>
<td>15-19 years</td>
<td>44</td>
<td>12.4</td>
</tr>
<tr>
<td>20 or more</td>
<td>15</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Years’ experience in audit field</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5</td>
<td>110</td>
<td>30.1</td>
</tr>
<tr>
<td>5-9 years</td>
<td>120</td>
<td>33.8</td>
</tr>
<tr>
<td>10-14 years</td>
<td>82</td>
<td>24.0</td>
</tr>
<tr>
<td>15-19 years</td>
<td>33</td>
<td>9.3</td>
</tr>
<tr>
<td>20 or more</td>
<td>10</td>
<td>2.8</td>
</tr>
<tr>
<td><strong>Number of people on audit team</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5</td>
<td>137</td>
<td>38.6</td>
</tr>
<tr>
<td>5-9</td>
<td>127</td>
<td>35.8</td>
</tr>
<tr>
<td>10-14</td>
<td>65</td>
<td>18.3</td>
</tr>
<tr>
<td>15-19</td>
<td>17</td>
<td>4.8</td>
</tr>
<tr>
<td>20 or more</td>
<td>9</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Undertook technology education course in past three months</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>77</td>
<td>21.7</td>
</tr>
<tr>
<td>No</td>
<td>278</td>
<td>78.3</td>
</tr>
</tbody>
</table>
6.8 Conclusion

The second and the main phase of primary research undertaken in this study consisted of a quantitative survey of the internal auditors in the three public audit organisations in Oman. This chapter justified the survey strategy adopted, and explained the process involved in developing hypotheses underlying the proposed conceptual models namely, (1), the T-O-E-I Framework, and (2), the Audit Quality Framework. The survey strategy involved the use of self-administered questionnaires. All sections and sub-sections of the survey instrument were discussed in detail in this chapter. The process involved in administering both the pilot study and main survey was comprehensively described. The required sample size for the quantitative survey was demonstrated to be 259.56. This chapter also presented the descriptive analysis of the quantitative data. This was used to provide summary demographic information about the respondents and information concerning their audit organisations. Chapter Seven details the factors analysis and regression analysis performed to confirm the T-O-E-I Framework and Audit Quality Framework.
7. Quantitative Analysis

7.1 Introduction

This chapter provides the results of the testing of the two theoretical models developed through the course of this thesis. Binary logistic regression was performed to test the T-O-E-I Framework in order to explain the internal auditor’s intention to adopt CAATs. Regression analysis was performed to examine the Audit Quality Framework, which is used to explain the factors underpinning the perceptions of high audit quality. A description of both the methods and the results of the descriptive statistical analysis, factor analysis and regression analysis is provided in this chapter.

7.2 Descriptive Statistics

Descriptive statistics are used to summarise and organise quantitative data (Holcomb, 2016). Measures of central tendency and measures of dispersion are used to explain the distribution of the data. Measures of central tendency characterise the distribution of variables in terms of average, middle point or the most common value. Mean, median and mode are three measures of central tendency (Walker and Maddan, 2012). Measures of dispersion capture the deviation of data values from the measure of central tendency (Naval 2015). The most commonly used measures of dispersion include range, interquartile range and standard deviation. Table 7.1 to Table 7.5 inclusive show the measures of central tendency and measures of dispersion for the variables in the model.
### Table 7.1 Descriptive Statistics Technological Factors

<table>
<thead>
<tr>
<th>Technological Benefits</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Std Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would be able to complete audit procedures more efficiently using CAATs</td>
<td>5.75</td>
<td>6</td>
<td>7</td>
<td>1.332</td>
<td>6</td>
</tr>
<tr>
<td>I would do more work on representative samples, and less work on high risk samples if I could use CAATs</td>
<td>5.60</td>
<td>6</td>
<td>6</td>
<td>1.144</td>
<td>6</td>
</tr>
<tr>
<td>Using CAATs would improve overall audit effectiveness</td>
<td>5.72</td>
<td>6</td>
<td>6</td>
<td>1.115</td>
<td>6</td>
</tr>
<tr>
<td>Using CAATs would increase the likelihood of referrals to an investigations team</td>
<td>5.34</td>
<td>6</td>
<td>6</td>
<td>1.338</td>
<td>6</td>
</tr>
<tr>
<td>I would be interested in participating in more CAATs training if it were available</td>
<td>5.62</td>
<td>6</td>
<td>7</td>
<td>1.295</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technological Risks</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Std Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would expect to encounter system problems (e.g., lockouts, connection issues etc.) that would impair the efficiency of my audit work</td>
<td>3.61</td>
<td>4</td>
<td>4</td>
<td>1.837</td>
<td>6</td>
</tr>
<tr>
<td>I would expect to encounter significant CAAT-related problems on my audits if used</td>
<td>3.34</td>
<td>3</td>
<td>3</td>
<td>1.689</td>
<td>6</td>
</tr>
<tr>
<td>How would you characterise the decision to adopt CAATs in your organisation?</td>
<td>4.77</td>
<td>5</td>
<td>4</td>
<td>1.395</td>
<td>6</td>
</tr>
<tr>
<td>How would you characterise the decision to use CAATs in your internal audit work?</td>
<td>5.23</td>
<td>5</td>
<td>5</td>
<td>1.306</td>
<td>6</td>
</tr>
<tr>
<td>How would you characterise the decision to adopt CAATs in your organisation?</td>
<td>5.46</td>
<td>6</td>
<td>7</td>
<td>1.33</td>
<td>6</td>
</tr>
</tbody>
</table>

All the items to measure technological factors namely technology benefits and technology risks were rated on a scale of 1 to 7, ranging from 1 strongly disagree to 7 strongly agree. The mean, median and mode for the items for technology benefits is closer to 7 which indicates that the participants strongly agreed with the statements which suggests that the majority of the respondents considered that adoption of CAATs has benefits for internal auditors. The first two statements on technological risks have a mean, median and mode score of between 3 and 4. This suggests that the majority of the respondents had a tendency to disagree with the statements suggesting that CAATs is of risk to internal audit work. The decision to adopt CAATs within the organisation of the internal auditor has a mean and median of 4.77 and 5 respectively which indicates that the majority of the participants considered that there is insignificant risk associated with adopting CAATs. The decision
to adopt CAATs is favourably perceived by the internal auditors. The scores for the measures of central tendency indicate that the participants regarded the decision to adopt CAATs as having high potential for gain for the organisation. Thus overall, the internal auditors who participated in the survey regarded adoption of technology as having more benefits than risks.

Table 7.2 Descriptive Statistics Organisational Factors

<table>
<thead>
<tr>
<th>Top Management Support</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Std Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>My organisation identifies employee needs for recognition, work satisfaction, competence and personal development</td>
<td>4.83</td>
<td>5</td>
<td>5</td>
<td>1.189</td>
<td>6</td>
</tr>
<tr>
<td>Top management ensures that the competence of auditors in my organisation is adequate for developing the skills required for computer assisted auditing</td>
<td>4.72</td>
<td>5</td>
<td>5</td>
<td>1.159</td>
<td>6</td>
</tr>
<tr>
<td>Top management plan, provide, control and monitor the financial resources necessary to maintain an effective and efficient audit system, and ensure the achievement of the objectives of the organisation</td>
<td>4.69</td>
<td>5</td>
<td>5</td>
<td>1.194</td>
<td>6</td>
</tr>
<tr>
<td>Top management in my organisation plans to implement new technology for internal auditing</td>
<td>4.61</td>
<td>5</td>
<td>5</td>
<td>1.24</td>
<td>6</td>
</tr>
<tr>
<td>Top management in my organisation does not provide me with the support I expect to have</td>
<td>3.65</td>
<td>4</td>
<td>4</td>
<td>1.625</td>
<td>6</td>
</tr>
<tr>
<td>Top management in my organisation is not sufficiently aware of the needs of internal auditors, as demonstrated by the small budget assigned to my department</td>
<td>3.81</td>
<td>4</td>
<td>5</td>
<td>1.632</td>
<td>6</td>
</tr>
<tr>
<td>Top management in my organisation does not provide enough support and encouragement for training and developing the internal auditors</td>
<td>3.65</td>
<td>4</td>
<td>5</td>
<td>1.739</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pressure from Management</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Std Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top management in my organisation represent high audit standards</td>
<td>4.6</td>
<td>5</td>
<td>5</td>
<td>1.35</td>
<td>6</td>
</tr>
<tr>
<td>Top management in my organisation regularly show that they care about audit work</td>
<td>4.77</td>
<td>5</td>
<td>5</td>
<td>1.158</td>
<td>6</td>
</tr>
<tr>
<td>Internal auditors in my organisation are expected to do as they are told</td>
<td>4.95</td>
<td>5</td>
<td>5</td>
<td>1.116</td>
<td>6</td>
</tr>
<tr>
<td>The boss is always right in my organisation</td>
<td>4.35</td>
<td>4</td>
<td>5</td>
<td>1.377</td>
<td>6</td>
</tr>
<tr>
<td>Ethical behaviour is the norm in my organisation</td>
<td>4.89</td>
<td>5</td>
<td>5</td>
<td>1.206</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 7.2 shows the results of the descriptive statistics of the two organisational factors. The descriptive statistics suggest that the participants agreed that the top management
support for skill development was important. Top management support in meeting employee needs has a mean and median score close to 4 which indicates that the majority of the participants neither disagreed nor agreed that top management does not meet the internal auditor’s needs. The statements concerning pressure from management have a mean, median and mode score close to 5 which indicates that the participants agreed that top management maintains a quality audit work environment with ethical standards which the internal auditor must follow.

Table 7.3 Descriptive Statistics Environmental Factors

<table>
<thead>
<tr>
<th>Time Pressure</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Std. Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time budgets have become tighter in recent years</td>
<td>4.72</td>
<td>5</td>
<td>5</td>
<td>1.29</td>
<td>6</td>
</tr>
<tr>
<td>Internal audit personnel sometimes take work home, and don't report the time spent on it, so as to meet the time budget</td>
<td>4.39</td>
<td>4</td>
<td>4</td>
<td>1.265</td>
<td>6</td>
</tr>
<tr>
<td>Review procedures in my department are adequate to detect early sign-offs on audits</td>
<td>4.71</td>
<td>5</td>
<td>5</td>
<td>1.085</td>
<td>6</td>
</tr>
<tr>
<td>There is a natural conflict between the concept of a time budget and the gathering of sufficient evidential matter</td>
<td>4.54</td>
<td>5</td>
<td>5</td>
<td>1.119</td>
<td>6</td>
</tr>
<tr>
<td>When the time budget is exceeded in one phase of an audit, the internal auditor feels a need to save time elsewhere</td>
<td>4.66</td>
<td>5</td>
<td>5</td>
<td>1.091</td>
<td>6</td>
</tr>
<tr>
<td>The time budget is a necessary management tool for the evaluation of an internal auditor</td>
<td>4.88</td>
<td>5</td>
<td>5</td>
<td>1.227</td>
<td>6</td>
</tr>
<tr>
<td>The time budget has a significant influence on the internal auditor’s job performance</td>
<td>5.01</td>
<td>5</td>
<td>5</td>
<td>1.161</td>
<td>6</td>
</tr>
<tr>
<td>The performance of a specific audit procedure is the primary responsibility of the internal auditor performing that procedure</td>
<td>4.78</td>
<td>5</td>
<td>5</td>
<td>1.179</td>
<td>6</td>
</tr>
<tr>
<td>The inclusion of specific audit steps in the audit programme facilitates the proper overall conduct of an audit</td>
<td>4.84</td>
<td>5</td>
<td>5</td>
<td>1.26</td>
<td>6</td>
</tr>
</tbody>
</table>

### Audit Independence

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Std. Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>The internal audit function in Omani state organisations is independent of the management of the organisations they audit</td>
<td>4.19</td>
<td>4</td>
<td>5</td>
<td>1.384</td>
<td>6</td>
</tr>
<tr>
<td>The internal audit function in Omani state organisations approves their own annual operations budget</td>
<td>4.54</td>
<td>5</td>
<td>5</td>
<td>1.245</td>
<td>6</td>
</tr>
<tr>
<td>Internal auditors in Omani state organisations perform follow-up investigations to determine if management responded to their recommendations</td>
<td>4.31</td>
<td>4</td>
<td>5</td>
<td>1.239</td>
<td>6</td>
</tr>
<tr>
<td>It is common for internal auditors to move to other functions within Omani state organisations</td>
<td>4.51</td>
<td>5</td>
<td>5</td>
<td>1.224</td>
<td>6</td>
</tr>
</tbody>
</table>
Internal auditors agree with managers of the organisations they audit the purpose of their investigation before commencing their work 4.62 5 5 1.176 6
Internal auditors file written reports on issues raised 4.71 5 5 1.26 6
Internal auditors report to a higher level in the organisation if management fail to respond to them 4.72 5 5 1.29 6

The environmental factors consists of time pressure and audit independence. The mean, median and mode scores of time pressure on evidence is close to 5 which indicates that the majority of the respondents agreed that to some extent there is time pressure on evidence and performance in their audit organisation. Audit independence was measured in terms of budgets and planning. The mean, median and mode for the statements on audit independence were close to 4 and 5, indicating that most of the respondents slightly agreed that there is audit independence for budgets and planning.

Table 7.4 Descriptive Statistics Individual Factors

<table>
<thead>
<tr>
<th>Technology Readiness</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Std. Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>New technologies contribute to a better quality of life</td>
<td>5.49</td>
<td>6</td>
<td>5</td>
<td>1.194</td>
<td>6</td>
</tr>
<tr>
<td>Technology increases my mobility</td>
<td>5.14</td>
<td>5</td>
<td>5</td>
<td>1.216</td>
<td>6</td>
</tr>
<tr>
<td>Technology gives people more control over their daily lives</td>
<td>5.13</td>
<td>5</td>
<td>5</td>
<td>1.161</td>
<td>6</td>
</tr>
<tr>
<td>Technology makes me more productive in my personal life</td>
<td>5.16</td>
<td>5</td>
<td>6</td>
<td>1.241</td>
<td>6</td>
</tr>
<tr>
<td>Other people come to me for advice on using new technologies</td>
<td>4.56</td>
<td>5</td>
<td>4</td>
<td>1.346</td>
<td>6</td>
</tr>
<tr>
<td>In general, I am among the first in my circle of friends to acquire new technology when it appears</td>
<td>4.48</td>
<td>5</td>
<td>4</td>
<td>1.401</td>
<td>6</td>
</tr>
<tr>
<td>I can usually figure out how to use new high-tech products and services without help from others</td>
<td>4.6</td>
<td>5</td>
<td>5</td>
<td>1.299</td>
<td>6</td>
</tr>
<tr>
<td>I keep up to date with the latest technological developments in my areas of interest</td>
<td>4.6</td>
<td>5</td>
<td>5</td>
<td>1.222</td>
<td>6</td>
</tr>
<tr>
<td>When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do</td>
<td>4.44</td>
<td>4</td>
<td>4</td>
<td>1.18</td>
<td>6</td>
</tr>
<tr>
<td>Technical support lines are not helpful because they don’t explain things in terms I understand</td>
<td>4.09</td>
<td>4</td>
<td>4</td>
<td>1.304</td>
<td>6</td>
</tr>
<tr>
<td>Sometimes, I think that technology systems are not designed for use by ordinary people</td>
<td>3.88</td>
<td>4</td>
<td>4</td>
<td>1.344</td>
<td>6</td>
</tr>
<tr>
<td>There is no such thing as a manual for a high-tech product or service that is written in plain language</td>
<td>3.89</td>
<td>4</td>
<td>4</td>
<td>1.392</td>
<td>6</td>
</tr>
</tbody>
</table>
People are too dependent on technology to do things for them 4.08 4 4 1.421 6
Too much technology distracts people to a point that is harmful 3.86 4 5 1.489 6
Technology lowers the quality of relationships by reducing personal interaction 4.33 5 5 1.582 6
I do not feel confident doing business with an organisation that can only be contacted online 4.14 4 5 1.719 6

**Social Influence**

| People who influence my behaviour think that I should use CAATs | 4.6 5 5 1.222 6 |
| People who are important to me think that I should use CAATs | 4.84 5 5 1.177 6 |
| Senior management in my organisation would be helpful to me in using CAATs | 4.88 5 5 1.253 6 |
| In general, my organisation would support the use of CAATs as they probably would want me to use CAATs | 4.89 5 5 1.296 6 |
| My manager would be very supportive of the use of CAATs for my job | 4.83 5 5 1.281 6 |

**Facilitating Conditions**

| I have the resources necessary to use CAATs | 4.45 5 5 1.297 6 |
| I have the knowledge and the training necessary to use CAATs | 4.9 5 5 1.062 6 |
| In all likelihood, CAATs would not be compatible with other systems I use | 5.34 5 6 1.128 6 |
| Assistance would be available for IT system difficulties if I used CAATs | 5.35 5 5 1.091 6 |

**Performance Expectancy (PE)**

| I would find CAATs useful in my job | 4.43 5 5 1.541 6 |
| Using technology would enable me to accomplish tasks more quickly | 5.16 5 5 1.23 6 |
| Using CAATs would increase my productivity | 5.26 5 6 1.224 6 |
| If I used CAATs, I would increase my chances of getting a pay rise | 5.17 5 5 1.318 6 |
| By using CAATs I would spend less time on routine tasks and unproductive activities | 5.06 5 5 1.095 6 |
| Using CAATs would increase the quality of the audit work I perform | 4.97 5 5 1.192 6 |

**Effort Expectancy**

| It would be easy for me to become skilful in using CAATs | 5.49 6 5 1.194 6 |
| I find CAATs easy to use | 5.14 5 5 1.216 6 |
| Learning to operate CAATs would be easy for me | 5.13 5 5 1.161 6 |
| Using CAATs may require a lot of my mental effort | 5.16 5 6 1.241 6 |

The descriptive statistics for individual factors including technology readiness, social influence, facilitating conditions, performance expectancy and effort expectancy are shown in table 7.4. Technology readiness was measured using innovativeness, optimism, insecurity and discomfort. The mean and median score for optimism is close to 5, which
suggests that the majority of the internal auditors who took part in the survey slightly indicated that they were optimistic concerning the use of CAATs in their work. The statement to measure innovativeness had mean score close to 4, which suggests that most of the participants neither agreed nor disagreed that they were innovative. The mean score for the statements on discomfort were close to 4, indicating that the participants neither agreed nor disagreed that the use of CAATs causes discomfort. The mean, median and mode for insecurity was mainly close to 4, although some statements were closer to five. This indicates that there is a level of insecurity in some cases while for most of the statements the participants neither agreed nor disagreed that usage of CAATs is a source of insecurity. The statements to measure social influence, facilitating conditions, effort expectancy and performance expectancy had a mean, median and mode close to five which indicates that most of the respondents agreed to some extent that society influences their decision to adopt CAATs, that a level of resources is available, that CAATs allows them to improve the performance in their jobs and that CAATs are easy to use.

Table 7.5 Descriptive Statistics Audit Quality

<table>
<thead>
<tr>
<th>Audit Quality</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Std. Deviation</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>The annual audit plan is determined completely by the Audit Director</td>
<td>4.85</td>
<td>5</td>
<td>5</td>
<td>1.342</td>
<td>6</td>
</tr>
<tr>
<td>The areas audited are very significant to the organisation</td>
<td>5.17</td>
<td>5</td>
<td>5</td>
<td>1.022</td>
<td>6</td>
</tr>
<tr>
<td>Internal auditors are able to cover all organisational units and all issues</td>
<td>4.61</td>
<td>5</td>
<td>5</td>
<td>1.365</td>
<td>6</td>
</tr>
<tr>
<td>The response of audited organisations to the audit is submitted in writing to the head of audit, and is relevant and comprehensive</td>
<td>4.82</td>
<td>5</td>
<td>5</td>
<td>1.15</td>
<td>6</td>
</tr>
<tr>
<td>The internal auditor also performs other activities such as developing procedures, and conducting economic and financial audits</td>
<td>4.72</td>
<td>5</td>
<td>5</td>
<td>1.304</td>
<td>6</td>
</tr>
<tr>
<td>There is regular follow-up by the audit manager to examine actions taken to correct problems identified</td>
<td>5.06</td>
<td>5</td>
<td>5</td>
<td>1.225</td>
<td>6</td>
</tr>
</tbody>
</table>
The quality of the audit work had a mean, median and mode score close to 5. This suggests that the participants slightly agreed to the statements. Most of the participants slightly agreed that quality in the audit work is maintained in their internal audit institutions.

7.2 Factor Analysis

Factor analysis (FA) is a multivariate statistical technique used to reduce the number of variables of study to fewer variables which capture the most variation in the sample (Butterfield & Ngondi 2016). When the researcher needs to determine and assess unobservable constructs, factor analysis is a suitable technique (Budaev 2010). Factor analysis allows the researcher to summarise data into limited clusters so that patterns and relationships in the data can be easily understood, analysed, and interpreted (Yong & Pearce 2013). The purpose of this technique is to explain the data with a smaller set of factors or components that represent the most variation in the sample. Accordingly, factor analysis facilitates reducing the complexity of the data by choosing the most significant variables (Taherdoost, Sahibuddin, & Jalaliyoon 2014).

Accordingly, factor analysis was used as in this research, for minimising the number of variables based on the variance in the initial data (Stewart, 1981). Factor analysis starts with the identification of the domain such as attitude, physical, mental and verbal abilities, personalities and other attributes (Tucker & MacCallum 1997). There are two main types of factor analysis namely, Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA) (Yong & Pearce 2013). While EFA is used to identify the underlying dimensional structure of the data examined, CFA is used to confirm whether the prior hypotheses are consistent with the structure obtained from a set of measures (Jackson, Gillaspy Jr, & Purc-Stephenson 2009). Prior hypotheses are the hypotheses generated
before the research is undertaken (Jackson et al. 2009). The objectives of this chapter are to
detail the methodological issues relevant to factor analysis, discuss the appropriateness of FA for this research and explain the methods adopted, and detail the findings of the factor analysis phase. The next section examines the methodological issues associated with factor analysis.

7.3 Methodological Issues in Factor Analysis

Five major methodological issues which were identified by Fabrigar et al., (1999) must be considered when conducting factor analysis. The first is the need to determine if factor analysis is actually appropriate to analyse the data when the goals of the research are considered. The second issue centres on the number of factors to be included. The third issue entails the selection of the procedure to fit the data. The fourth involves determining the sample size and variables to be included. The fifth and final issue, concerns the selection of the method for rotating the initial factor analytic solution to a final solution (Fabrigar et al. 1999).

7.3.1 Appropriateness of Factor Analysis

Both factor analysis (FA) and principal component analysis (PCA) share the common goal of reducing the variables in the data (Velicer & Jackson 1990). Principal component analysis (PCA) is essentially a data reduction method (Osborne & Costello 2009). In PCA, the components are calculated as linear combinations of the original variables. In factor analysis, the original variables are defined as linear combinations of the underlying latent factors (Iacobucci, Saldanha, & Deng 2007). With PCA, the goal is to explain as much of the total variance in the variables as possible (Osborne & Costello 2009). However, the goal in factor analysis is to explain the covariances or correlations between the variables
PCA and factor analysis are often applied to the same data in sequence, though this is not good practice (Tabachnik and Fidell 2001). For example, PCA can be used to determine the number of factors to extract in a factor analytic study. The choice between FA and PCA is based on different conditions. When the researcher needs to avoid problems of factor indeterminacy and only requires an empirical summary of the data set, principal component analysis is the best choice (Park, Dailey and Lemus 2002). Factor indeterminacy is a condition where the common factors cannot be uniquely determined by their related manifest variables (Velicer & Jackson 1990). Factor indeterminacy results in different common factors replicating the same pattern of correlation in the manifest variables. However, if the researcher needs a theoretical solution uncontaminated by variability due to error or uniqueness, factors analysis is more suitable (Park, Dailey, & Lemus 2002). Factor analysis focuses on the shared variance of variables, while differentiating between common variances and unique variances (Park et al. 2002). However, the focus of PCA is on the total variation between the variables (Park et al. 2002).

Factor analysis can be used to identify one or more underlying variables that covary across the measures or set of items (Trninić, Jelaska, & Štalec 2013). It is appropriate to use factor analysis when there are numerous variables which are correlated and which occur simultaneously (Trninić et al. 2013). Until a meaningful solution is reached, there is refinement and comparison of solutions in a cyclical manner (Beavers et al. 2013).
Exploratory factors analysis (EFA) is commonly used by researchers to reduce a large set of variables into a smaller and manageable number of variables, or to explore relationships between variables to develop a theory. It allows the researcher to go beyond the individual items analysed (Reio and Shuck 2015). EFA is a technique performed with larger sample sizes, with the lowest reasonable sample size for the technique being set at 50 (Winter et al. 2009). An exploratory factor analysis is most suitable when the variables are grouped together based on the deductions from literature before the analysis of data.

7.3.2 Number of Factors

The practicality of the research rather than the theory determines the number of variables and the rotational scheme in factor analysis (Williams, Onsman, & Brown 2010). The number of factors needs to be represented by an adequate number of variables (Fabrigar et al. 1999). According to Fabrigar et al., (1999) the number of variables that must be included should be three to five times the expected number of common factors. The selected variables should comprise several variables that are likely to be influenced by the common factors (Fabrigar et al. 1999, MacCallum et al. 1999). An important aspect to be considered when selecting the number of variables is that a sufficient number of variables are selected without over-determination of factors (Fabrigar et al. 1999, MacCallum et al. 1999). Over-determination refers to the degree to which a common factor can be defined by a set of indicators (MacCallum et al. 2001). When the ratio of the number of variables to the number of factors is more than five times high, there is high over-determination, and, when the ratio is less, there is weak over-determination (MacCallum, Widaman, Zhang, & Hong 1999). When there is high over-determination, the impact of sampling error is less (MacCallum et al. 1999).
7.3.3 Communality Estimates

Communality refers to the proportion of variance of variables that can be explained by the factors (Pett, Lackey, & Sullivan 2003). The communality estimate can be defined as the estimated proportion of variance of the variable that is free of error variance, and is shared with other variables in the matrix (Yong & Pearce 2013). Low sample sizes are not an issue when factors are defined by a number of items and the communalities are greater than 0.60 (Fabrigar et al. 1999, Williams et al. 2010). According to Fabrigar et al., (1999) there are many reasons for low communality. A common reason for low communality is that the measured variable has low reliability. This means that the variance in the variable due to random error reduces the reliability of the variable. In the case of a situation where one item does not clearly theoretically link to the construct under investigation, this also results in low communality. Low communality may result in distortion in the results, and so must be avoided (Fabrigar et al. 1999). A communality of greater than 0.40 is ideal for factor analysis as it suggests that nearly 50% of the variance is accounted for by the factor (Beavers et al. 2013).

7.3.4 Sample Size in Factor Analysis

The suggested sample size for factor analysis varies from 100 to 800 participants, and three to 21 times the number of variables analysed (Winter et al. 2009). Wilson, VanVoorhis and Morgan (2007) assert that the accuracy and quality of factor analysis is higher when the sample size is more than 300 participants, as to do a factor analysis, the minimum required sample is 50 participants. Although the suggested range of samples is from 50 to 1,000, the most highly recommended sample size is above 500, whilst a sample size of 200 to 250 is also considered acceptable (Winter et al. 2009). Tabachnick and Fidell (2001) ranked sample sizes of 50, 100, 200, 300, 500 and 1,000, as very poor, poor, fair, good,
very good, and excellent respectively. This is because a larger sample size is more suitable to conform to the norms of factors analysis (Winter et al. 2009). Another reason for the need for a larger sample size is the tendency of the correlation coefficient to fluctuate significantly with smaller sample sizes compared to larger sample sizes (Fabrigar et al. 1999). However, a smaller sample is considered adequate when there are four to five variables with communalities of 0.40 or higher (Fabrigar et al. 1999).

Another way to decide on the sample size is by reference to the number of cases per variable. The number of cases per variable can range from 3:1 to 20:1 (Pearson 2008; Winter et al. 2009). Cattell (1978) proposes three to six samples per variable. Gorsuch (1990) recommends that the ratio of sample to a variable should be a minimum of five times, while Everitt (1975) suggests 10 participants for every variable. According to Winter et al., (2009) the higher the number of cases per variable, the lower the chance of over-fitting the data. Over-fitting refers to the situation when the fit of the model to a given dataset is over-estimated (Osborne and Banjanovic 2016). Over-fitting can result in an erroneous conclusion, extraction of erroneous factors, or mistakes in the alignment of an item to the factors (Osborne and Banjanovic 2016).

Sample size depends on various aspects of the study including the level of over-determination of the factors, the level of communality of the variables, and the number of variables (Trninić et al. 2013). Once the procedures for the FA are selected, the next step is to determine the steps for performing the FA. The following section explains the assumption of multivariate normality and the tests that can be used to test that assumption.
7.4 Multivariate Normality Tests

The assumption of multivariate normality must be ensured in order to continue with parametric statistical analysis such as principal component analysis for variables (Korkmaz, Goksuluk and Zararsiz 2016). The results of the multivariate normality test determine the most suitable method to be used for factor extraction, since parametric multivariate analysis can only be performed if the assumption of multivariate normality can be confirmed (Osborne and Costello 2009). Multivariate normality tests measure the strength of the relationship and the normality of the distribution (Hadi, Abdullah, & Sentosa 2016). There are several statistical and graphical methods available to test the multivariate normality of variables. The chi-square Q-Q plot involves several linear and sequential steps (Williams et al. 2012). A Bartlett test of sphericity value of less than 0.05, or a Kaiser-Meyer-Olkin (KMO) test for sampling adequacy of above 0.70, confirms the assumption of multivariate normality and that the data is acceptable for further analysis in factor analysis (Hadi et al. 2016). The Bartlett test will be used in this thesis.

7.5 Number of Factors to Include

In factor analysis, the number of factors that must be retained for rotation after the extraction of data is very important (Osborne and Costello 2009). This is because over-extraction and under-extraction of factors retained for rotation can have a detrimental effect on the results (Osborne and Costello 2009). Factors with eigenvalues of greater than one are retained by most statistical software, as are factors that contribute to 70-80% of the variance (Hadi et al. 2016). According to Kline (2013), factors are retained whenever the eigenvalues based on the original scores are greater than the eigenvalues for the corresponding factors based on the randomised scores. The maximum likelihood factor extraction method allows the researcher to compare models with two, three, and four
factors (Park et al. 2002). In general, the solution to factor analysis depends on the
interpretation of the researcher to a certain extent, regardless of the number of factors
(Trninić et al. 2013).

7.6 Choosing a Rotation Method for the Final Solution

Rotation applies when there is more than one factor retained and rotation is part of
multifactor models in factor analysis (Kline 2013). When factors are few, the rotation
distorts the final solution of the factor analysis. Factor rotation allows the interpretability
of the extracted factors so that the best fitting factors for the model can be identified
(Brown 2006). The basic aim of rotation is to streamline the factor structure of the
variables with high item loadings on one factor and weak loadings on the rest of the factors
(Williams et al. 2010). Rotation methods can be classified into two broad categories
namely, orthogonal rotation and oblique rotation (Kline 2013). The factors in the
orthogonal rotations are constrained to be uncorrelated which means that the orientation
of the factor axes is only permitted at 90 degree angles (Brown, 2006). The best known
and most used orthogonal rotation is the varimax rotation (Fabrigar et al. 1999). Oblique
rotations are often more reasonable, but it is easier to report orthogonal rotations because
unlike oblique rotations, the factor loadings of orthogonal rotations reflect the simple
correlation between the indicators and factors (Tabachnick et al. 2001; Brown 2006).

7.6.1 Deciding on a Solution

Factor analysis with more than a single factor does not have a unique solution as there are
an infinite number of equally fitting solutions to choose from (Fabrigar et al. 1999). In
searching for an optimal solution, a minimum of 25 iterations must be performed, and a
higher number of iterations may be performed if the data is particularly large (Yong and
Pearce 2013). The most important aspect of factor analysis is that the solution should retain important information from the original data, while redundant or unnecessary information, and random sampling errors should all be removed (Matsunaga 2015). Factor solutions that are stable, and are an indication of population factors depend on issues such as sample size, the number of variables, and the number of factors retained (Trninić et al. 2013). Choosing a final solution is relatively straightforward when there is replication of solutions in the results after rotation. However, if the solutions are dramatically different after subsequent rotations, then it is difficult to select a single solution as there is no replication of results (Kline 2013). The next section provides the results of the principal component analysis with varimax rotation.

7.7 Principal Component Analysis
PCA was performed with the objective of data reduction and to examine the variance in the measured variables (Fabrigar et al. 1999). PCA with varimax rotation was conducted in this study to extract factors, as the factors were already well tested in the literature. PCA was used for the reason that it would be able to confirm if the underlying constructs were being properly measured. While a CFA approach was investigated, the results from the CFA software could not be used in SPSS directly with the binary logistic regression model. Results are presented in Tables 7.6 to 7.17 inclusive. The extraction values for communalities for all items of the constructs of the study were set to be above 0.40. A communality of 0.40 to 0.70 is considered moderate, and therefore, regarded as appropriate for this research (Fabrigar et al. 1999). Communalities that are lower than 0.40 denote low reliability of variables, and that the variance cannot be explained by common factors. Accordingly, items with low communalities were removed. The following sections explain
the results of the PCA on the variables of T-O-E-I Framework and Audit Quality Framework.

7.7.1 The T-O-E-I Framework – Principal Component Analysis
The T-O-E-I Framework is the model developed to identify the variables that predict the internal auditor’s intention to adopt CAATs. The dependent variable for the T-O-E-I Framework is the internal auditor’s intention to adopt technology. The dependent variable is measured in binary scale with yes or no options for the internal auditors participating in the survey. The independent variables in the T-O-E-I framework that are examined to predict the dependent variable are technological factors, organisational factors, environmental factors and individual factors. This research examined how the dependent variable, namely the internal auditor’s intention to adopt technology responds to each of these factors. The results of the principal component analysis of the variables of the T-O-E-I Framework are provided in Table 7.6 to Table 7.16 inclusive. The PCA of technological factors, organisational factors, environmental factors and individual factors allows the identification of the principal components that account for the maximum variation in the internal auditor’s intention to adopt technology.

7.7.1.1 Technological Factors
The technological factors consist of technology benefits and technological risks. The principal components of technological benefits and technological risks that are representative of these constructs are identified and explained next.
There is a need for increased usage of technology in the audit process to obtain sufficient evidence when organisational data only exists in electronic form (Braun and Davis 2003). Internal auditors can review an organisation’s systems, information and activities more effectively using computer assisted auditing, and in such a way as increases the effectiveness and productivity of the internal audit function (Weidenmier and Ramamoorti 2006). The use of IT has also become an essential means of keeping abreast of advances in professional auditing standards and best practice (Moorthy et al. 2011). Table 7.6 presents the result of the PCA for the construct technological benefits.

<table>
<thead>
<tr>
<th>Item - Technological Benefits</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would be able to complete audit procedures more efficiently using CAATs</td>
<td>0.798</td>
</tr>
<tr>
<td>I would do more work on representative samples, and less work on high risk samples if I could use CAATs</td>
<td>0.833</td>
</tr>
<tr>
<td>Using CAATs would improve overall audit effectiveness</td>
<td>0.817</td>
</tr>
<tr>
<td>Using CAATs would increase the likelihood of referrals to an investigations team</td>
<td>0.724</td>
</tr>
<tr>
<td>I would be interested in participating in more CAATs training if it were available</td>
<td>0.785</td>
</tr>
</tbody>
</table>

The five items for the technological benefits construct were analysed using PCA with varimax rotation. The Kaiser-Meyer-Olkin (KMO) value of greater than 0.60 suggests that the sample is adequate for this study (Tabachnik and Fidell 2001). The component loadings for the principal components selected for this study were all greater than 0.70 showing that all items loaded well onto the factor. One factor accounted for 62.675% of the variance demonstrating that a one factor solution is appropriate. The Cronbach Alpha was calculated to be 0.846 which is a good result as it is above the threshold of 0.700 (Tabachnik and Fidell, 2001).
Technological Risks

Technological risks refer to the risks perceived to arise from the use of CAATs such as computer fraud and the threat of deficiencies in controls, all of which may affect the company's intention to use technology (Rosli et al. 2012). The level of technological risk is a major predictor of technology acceptance behaviour (Lam, Chiang, & Parasuraman 2008). The systems used for audit processes and documentation influence the effectiveness of the internal audit function. Ineffective audit systems are a major technological risk to internal audit effectiveness and productivity. Table 7.7 presents the results of the PCA for the construct technological risks.

Table 7.7 Items for Construct Technological Risks

<table>
<thead>
<tr>
<th>Technological Risks</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would expect to encounter system problems (e.g. lockouts, connection issues etc.) that would impair the efficiency of my audit work</td>
<td>.757</td>
</tr>
<tr>
<td>I would expect to encounter significant CAAT-related problems on my audits if used</td>
<td>.758</td>
</tr>
<tr>
<td>How would you characterise the decision to adopt CAATs in your organisation? (Significant risk – Insignificant risk)</td>
<td>-.716</td>
</tr>
<tr>
<td>How would you characterise the decision to use CAATs in your internal audit work?</td>
<td>-.685</td>
</tr>
<tr>
<td>How would you characterise the decision to adopt CAATs in your organisation? (High potential for loss – High potential for gain)</td>
<td>-</td>
</tr>
</tbody>
</table>

The five items for technological risks were analysed using PCA with varimax rotation. The fifth item had a low communality (0.365), and so was removed. The remaining four items were factor analysed again and the outcome showed a single factor which accounted for 50.384% of the variance. The component loadings were satisfactory. The Cronbach Alpha was 0.654. Ideally the Cronbach Alpha should be above 0.700 but in this case because the factor is a mixture of Likert and semantic differential scales this may have caused some
variance in the responses. Even though the alpha value was slightly below what is required the factor was retained for future analysis.

7.7.1.2 Organisational Factors

The organisational factors consisted of top management support and pressure from management. The principal components of top management support and pressure from management which are representative of these constructs are identified and explained next.

➢ Top Management Support

The management literature offers ample evidence for the role of top management support in the success of almost all programmes and processes within the organisation. According to Alkebsi, Aziz, Mohammed and Dhaifallah (2014), top management support can take many forms such as authorising access to data and facilitating communication with management. Management who are supportive of evaluating and extending IT audit systems can increase the level of adoption of IT for the internal audit process (Alkebsi, Aziz, Mohammed, & Dhaifallah 2014). Table 7.8 presents the results of the PCA conducted for the construct top management support.
### Table 7.8 Items for Construct Top Management Support

<table>
<thead>
<tr>
<th>Item - Top Management Support</th>
<th>Loading</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Top Management Support for Skills Development (TMS1)</td>
<td>Top Management Support for meeting needs (TMS2)</td>
</tr>
<tr>
<td>My organisation identifies employee needs for recognition, work satisfaction, competence and personal development</td>
<td>0.746</td>
<td></td>
</tr>
<tr>
<td>Top management ensures that the competence of auditors in my organisation is adequate for developing the skills required for computer assisted auditing</td>
<td>0.815</td>
<td></td>
</tr>
<tr>
<td>Top management plan, provide, control and monitor the financial resources necessary to maintain an effective and efficient audit system, and ensure the achievement of the objectives of the organisation</td>
<td>0.725</td>
<td></td>
</tr>
<tr>
<td>Top management in my organisation plans to implement new technology for internal auditing</td>
<td>0.751</td>
<td></td>
</tr>
<tr>
<td>Top management in my organisation does not provide me with the support I expect to have</td>
<td>0.846</td>
<td></td>
</tr>
<tr>
<td>Top management in my organisation is not sufficiently aware of the needs of internal auditors, as demonstrated by the small budget assigned to my department</td>
<td>0.911</td>
<td></td>
</tr>
<tr>
<td>Top management in my organisation does not provide enough support and encouragement for training and developing the internal auditors</td>
<td>0.870</td>
<td></td>
</tr>
</tbody>
</table>

Two factors accounted for 66.544% of the variance and so were retained. All component loadings were above 0.70. This suggests that all the components to measure top management support explain significant variation in the constructs. The Cronbach Alpha which was tested for items numbered one to four was 0.756, suggesting that the internal consistency of the sub-scale is acceptable. The Cronbach Alpha result for items numbered five to seven was 0.851 which suggests a high level of internal consistency for this sub-scale.
Pressure from Management

A study conducted by Bierstaker et al. (2014) identified that pressure from management influences the likelihood of auditors adopting CAATs. This is because the increased outcome expectations of management may force internal auditors to rely on CAATs to perform internal auditing more efficiently (Bierstaker et al. 2014). The scope of the internal audit function has increased dramatically over the past decade with internal auditors now responsible for areas including fraud detection, risk management, and identifying areas for operational improvements to enhance financial performance (Bierstaker et al. 2014). Table 7.9 presents the results of the PCA for the construct pressure from management.

Table 7.9 Items for Construct Pressure from Management

<table>
<thead>
<tr>
<th>Item- Pressure from Management</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Top management in my organisation represent high audit standards</td>
<td>0.861</td>
</tr>
<tr>
<td>Top management in my organisation regularly show that they care about audit work</td>
<td>0.820</td>
</tr>
<tr>
<td>Internal auditors in my organisation are expected to do as they are told</td>
<td>0.674</td>
</tr>
<tr>
<td>The boss is always right in my organisation</td>
<td>-</td>
</tr>
<tr>
<td>Ethical behaviour is the norm in my organisation</td>
<td>-</td>
</tr>
</tbody>
</table>

The five items for the pressure from management construct were analysed using PCA with varimax rotation. The fifth item had a very low communality at 0.278, and so was removed. On the second round of analysis, the fourth item had a very low communality at 0.258, and was also removed. One factor accounted for 62.221% of the variance. The remaining items had loadings above 0.600 which is strong (Tabachnik & Fidell, 2001). The Cronbach Alpha was tested and found to be 0.694. The recommended value for Cronbach Alpha to ensure construct reliability is 0.70 or above (Wickramasinghe 2016). This factor was retained for further analysis as the value was close to 0.70.
7.7.1.3 Environmental Factors

The environmental factors consisted of time pressure and audit independence. The principal components of time pressure and audit independence that are representative of these constructs are identified and explained next.

➢ Time Pressure

Time pressure is a significant determinant of internal audit effectiveness. According to McDaniel (1990), lower time pressure allows the creation of structured audit programmes, which in turn increase the effectiveness of the internal audit process. Such inefficiencies can result in increased costs and reduced audit effectiveness (McDaniel 1990). To improve audit service quality when there are limited resources such as time, internal audit professionals have increasingly turned to technology for a value added internal audit function (Curtis and Payne 2014). Janvrin et al., (2008) found that completing tasks within the time limit set, is one of the most significant advantages of CAATs. Table 7.10 presents the results of the PCA for the construct time pressure.
Table 7.10 Items for Construct Time Pressure

<table>
<thead>
<tr>
<th>Item - Time Pressure</th>
<th>Loading</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time</td>
<td>Time</td>
</tr>
<tr>
<td></td>
<td>Pressure on Evidence</td>
<td>Pressure on Performance</td>
</tr>
<tr>
<td>Time budgets have become tighter in recent years</td>
<td>0.708</td>
<td></td>
</tr>
<tr>
<td>Internal audit personnel sometimes take work home, and don't report the time spent</td>
<td>0.744</td>
<td></td>
</tr>
<tr>
<td>on it, so as to meet the time budget</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review procedures in my department are adequate to detect early sign-offs on audits</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>There is a natural conflict between the concept of a time budget and the gathering</td>
<td>0.749</td>
<td></td>
</tr>
<tr>
<td>of sufficient evidential matter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When the time budget is exceeded in one phase of an audit, the internal auditor</td>
<td>0.548</td>
<td></td>
</tr>
<tr>
<td>feels a need to save time elsewhere</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The time budget is a necessary management tool for the evaluation of an internal</td>
<td>-0.720</td>
<td></td>
</tr>
<tr>
<td>auditor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The time budget has a significant influence on the internal auditor’s job</td>
<td>-0.841</td>
<td></td>
</tr>
<tr>
<td>performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The performance of a specific audit procedure is the primary responsibility of the</td>
<td>-0.725</td>
<td></td>
</tr>
<tr>
<td>internal auditor performing that procedure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The inclusion of specific audit steps in the audit programme facilitates the proper</td>
<td>-0.652</td>
<td></td>
</tr>
<tr>
<td>overall conduct of an audit</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results for the nine items for the time pressure construct were analysed using PCA with varimax rotation. The third item had a low communality at 0.386, and so was removed. Two factors remained which accounted for 54.224% of the variance. All the remaining component loadings had as they are either above or close to 0.600. The Cronbach Alpha for time pressure on evidence was 0.713 and time pressure on performance of 0.723 were both acceptable.
Audit Independence

The quality of the service provided by the internal audit function depends on the independence and objectivity of internal auditors (Moorthy et al. 2011). Furthermore, independence of internal auditors, along with effective IT-based internal audits, can reduce external audit costs through allowing external auditors to cooperate with, and rely more heavily on the work performed by internal auditors (Hall 2010). Table 7.11 presents the results of the PCA for the construct of audit independence.

Table 7.11 Items for Construct Audit Independence

<table>
<thead>
<tr>
<th>Item - Audit Independence</th>
<th>Loading Audit Independence Budgets</th>
<th>Loading Audit Independence Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>The internal audit function in Omani state organisations is independent of the management of the organisations they audit</td>
<td></td>
<td>0.640</td>
</tr>
<tr>
<td>The internal audit function in Omani state organisations approves their own annual operations budgets</td>
<td></td>
<td>0.798</td>
</tr>
<tr>
<td>Internal auditors in Omani state organisations perform follow-up investigations to determine if management responded to their recommendations</td>
<td></td>
<td>0.686</td>
</tr>
<tr>
<td>It is common for internal auditors to move to other functions within Omani state organisations</td>
<td>0.670</td>
<td></td>
</tr>
<tr>
<td>Internal auditors agree with managers of the organisations they audit the purpose of their investigation before commencing their work</td>
<td>0.822</td>
<td></td>
</tr>
<tr>
<td>Internal auditors file written reports on issues raised</td>
<td>0.691</td>
<td></td>
</tr>
<tr>
<td>Internal auditors report to a higher level in the organisation if management fail to respond to them</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

The results for the seven items for the audit independence construct were analysed using PCA with varimax rotation. The seventh item had a low communality at 0.243, and so was removed. The analysis was re-run and two components explained more than 64% of the variation. The Cronbach Alpha for audit independence budgets and for audit
independence planning was 0.620 and 0.556 respectively. Both of these were lower than expected, but given the importance of the construct they were retained.

7.7.1.4 Individual Factors

The individual factors consisted of technological readiness, social influence, facilitating conditions, performance expectancy and effort expectancy. The principal components of these factors are identified and explained next.

➢ Technological Readiness

Technological readiness of an organisation influences the decision of internal auditors to use CAATs (Moorthy et al. 2011). Similarly, the technological readiness of an individual determines the cost of implementing IT based internal auditing, thus influencing the decision to adopt IT within the internal audit process (Lotto 2013). According to Venkatesh, et al., (2003) organisations that are ready for CAAT adoption increase their internal auditors’ motivation by providing appropriate staff training and technology maintenance support. Table 7.12 presents the result of the PCA for the construct technological readiness.

<table>
<thead>
<tr>
<th>Item-Readiness</th>
<th>Technological Readiness</th>
<th>Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Innovativeness</td>
<td>Insecurity</td>
</tr>
<tr>
<td>New technologies contribute to a better quality of life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology increases my mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology gives people more control over their daily lives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology makes me more productive in my personal life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statement</td>
<td>Score</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Other people come to me for advice on using new technologies</td>
<td>0.672</td>
<td></td>
</tr>
<tr>
<td>In general, I am among the first in my circle of friends to acquire new technology when it appears</td>
<td>0.780</td>
<td></td>
</tr>
<tr>
<td>I can usually figure out how to use new high-tech products and services without help from others</td>
<td>0.779</td>
<td></td>
</tr>
<tr>
<td>I keep up to date with the latest technological developments in my areas of interest</td>
<td>0.702</td>
<td></td>
</tr>
<tr>
<td>When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do</td>
<td>0.594</td>
<td></td>
</tr>
<tr>
<td>Technical support lines are not helpful because they don’t explain things in terms I understand</td>
<td>0.747</td>
<td></td>
</tr>
<tr>
<td>Sometimes, I think that technology systems are not designed for use by ordinary people</td>
<td>0.800</td>
<td></td>
</tr>
<tr>
<td>There is no such thing as a manual for a high-tech product or service that is written in plain language</td>
<td>0.719</td>
<td></td>
</tr>
<tr>
<td>People are too dependent on technology to do things for them</td>
<td>0.632</td>
<td></td>
</tr>
<tr>
<td>Too much technology distracts people to a point that is harmful</td>
<td>0.704</td>
<td></td>
</tr>
<tr>
<td>Technology lowers the quality of relationships by reducing personal interaction</td>
<td>0.885</td>
<td></td>
</tr>
<tr>
<td>I do not feel confident doing business with an organisation that can only be contacted online</td>
<td>0.725</td>
<td></td>
</tr>
</tbody>
</table>
The 16 items for the technological readiness construct were analysed using PCA with varimax rotation. In general the Technology Readiness Index (TRI) achieved the same result as that found by Parasuraman and Colby (2015). However, one of the discomfort items loaded into the innovativeness sub-construct. While the loading was relatively low at 0.594, it was retained as it was so close to the 0.60 cut off employed. The Cronbach Alpha was tested for the four factors namely: Optimism, Innovativeness, Discomfort and Insecurity, and showed a value of 0.773 for Optimism, 0.776 for Innovativeness, 0.723 for Discomfort and 0.766 for Insecurity. A value greater than 0.70 suggests that the internal consistency of the components is considered acceptable (Tabachnik & Fidell, 2001).

➢ Social Influence

Social influence refers to the degree to which a person decides to use a new IT system based on their perception of how important others in their social circle believes it to be (Venkatesh et al. 2003). Curtis and Payne (2008) note that internal auditors’ perceptions of their direct managers’ support for their use of CAATs influences their decision to adopt CAATs. Table 7.13 provides the results of the PCA for the construct social influence.

**Table 7.13 Items for Construct Social Influence**

<table>
<thead>
<tr>
<th>Item - Social Influence</th>
<th>Loading Social Influence Organisation</th>
<th>Loading Social Influence Personal</th>
</tr>
</thead>
<tbody>
<tr>
<td>People who influence my behaviour think that I should use CAATs</td>
<td></td>
<td>0.942</td>
</tr>
<tr>
<td>People who are important to me think that I should use CAATs</td>
<td></td>
<td>0.864</td>
</tr>
<tr>
<td>Senior management in my organisation would be helpful to me in using CAATs</td>
<td>0.687</td>
<td></td>
</tr>
<tr>
<td>In general, my organisation would support the use of CAATs as they probably would want me to use CAATs</td>
<td>0.863</td>
<td></td>
</tr>
<tr>
<td>My manager would be very supportive of the use of CAATs for my job</td>
<td>0.873</td>
<td></td>
</tr>
</tbody>
</table>
The five items for the social influence construct were analysed using PCA with varimax rotation. Two factors accounted for 75.049% of the variance. The Cronbach Alpha was 0.761 for social influence organisation, and 0.796 for social influence personal. Eckhardt, Laumer and Weitzel (2009) observe that in most studies the impact of social influence on technology adoption only use peer groups and that considering only one subjective norm measure is somewhat naive as it prevents one from understanding the differential impact of various peer groups on technology adoption. Hence, this study examined the differential impact of management and peer groups on technology adoption intention of internal auditors.

**Facilitating Conditions**

Facilitating conditions refer to an individual’s perception of the organisational and technical infrastructure available to support their use of information technology in the organisation (Venkatesh et al. 2003). Facilitating conditions may vary depending on the setting and type of technology applications (Aypay, Celik, Aypay, & Sever 2012). Table 7.14 presents the results of the PCA conducted for the construct facilitating conditions.

<table>
<thead>
<tr>
<th>Item - Facilitating Conditions</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have the resources necessary to use CAATs</td>
<td>0.671</td>
</tr>
<tr>
<td>I have the knowledge and the training necessary to use CAATs</td>
<td>0.674</td>
</tr>
<tr>
<td>In all likelihood, CAATs would not be compatible with other systems I use</td>
<td>-</td>
</tr>
<tr>
<td>Assistance would be available for IT system difficulties if I used CAATs</td>
<td>0.705</td>
</tr>
</tbody>
</table>

The results for the four items for the facilitating conditions construct were analysed using PCA with varimax rotation. The third item had a low communality at 0.308, and so was
removed. All component loadings for the construct facilitating conditions were above 67%. The Cronbach Alpha was 0.544. The low alpha value was disappointing, given the prevalence of the construct in the literature, but given the importance of the construct it was retained for the final model.

- **Performance Expectancy**

Performance expectancy is an individual’s perception that the use of an IT system can improve their job performance (Venkatesh et al. 2003). Accordingly, the internal auditor's expectation that his or her performance is likely to improve by using CAATs is likely to increase their likelihood of adopting CAATs (Curtis and Payne 2014). Table 7.15 presents the results of the PCA conducted for the construct performance expectancy.

**Table 7.15 Items for Construct Performance Expectancy**

<table>
<thead>
<tr>
<th>Item - Performance Expectancy</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would find CAATs useful in my job</td>
<td>0.784</td>
</tr>
<tr>
<td>Using technology would enable me to accomplish tasks more quickly</td>
<td>0.819</td>
</tr>
<tr>
<td>Using CAATs would increase my productivity</td>
<td>0.730</td>
</tr>
<tr>
<td>If I used CAATs, I would increase my chances of getting a pay rise</td>
<td>-</td>
</tr>
<tr>
<td>By using CAATs I would spend less time on routine tasks and unproductive activities</td>
<td>0.704</td>
</tr>
<tr>
<td>Using CAATs would increase the quality of the audit work I perform</td>
<td>0.711</td>
</tr>
</tbody>
</table>

The results for the six items for performance expectancy were analysed using PCA with varimax rotation. The fourth item had a low communality at 0.048, and so was removed. This was not surprising given that the context of this research is state owned organisations where pay determination is external. One factor accounted for 56.724% of the variance and so was also removed. The Cronbach Alpha was 0.731 for performance expectancy and therefore acceptable.
Effort Expectancy

Effort expectancy is an individual’s perception of the degree of effort required to use an IT system (Venkatesh et al. 2003). According to Venkatesh et al., (2003) the acceptance and attitude of individuals towards CAATs depends on the perceived usefulness (PU) of the technology, and the perceived ease of use (PEU) associated with it. Ease of use of CAATs depends on the IT training provided to the internal auditor; a factor which bears the capacity to influence effort expectancy (Janvrin et al. 2008). Table 7.16 presents the results of the PCA conducted for the construct effort expectancy.

Table 7.16 Items for Construct Effort Expectancy

<table>
<thead>
<tr>
<th>Item - Effort Expectancy</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>It would be easy for me to become skilful in using CAATs</td>
<td>0.800</td>
</tr>
<tr>
<td>I find CAATs would be easy to use</td>
<td>0.852</td>
</tr>
<tr>
<td>Learning to operate CAATs would be easy for me</td>
<td>0.809</td>
</tr>
<tr>
<td>Using CAATs may require a lot of my effort</td>
<td>-</td>
</tr>
</tbody>
</table>

The results for the four items for effort expectancy were analysed using PCA with varimax rotation. The fourth item had a low communality at 0.322, and so was removed. One factor accounted for 70.966% of the variance. The component loadings of the remaining components for the construct effort expectancy were greater than 0.80. The Cronbach Alpha was 0.745 for effort expectancy and therefore the internal consistency of the items were acceptable.

7.7.2 Audit Quality Framework

This section explains the PCA with varimax rotation for the variables of the Audit Quality Framework. The Audit quality Framework is used to examine the factors that influence the internal auditor’s perception of internal audit quality. The dependent variable for the
Audit Quality Framework is the internal auditor’s perception of audit quality. The independent variables used to predict the internal auditor’s perception of audit quality were performance expectancy, time pressure, audit independence, pressure from management, top management support and adoption intention. This next section presents the PCA of the audit quality variable. The remaining variables in the Audit Quality Framework come from the T-O-E-I Framework.

7.7.2.1 Audit Quality

According to Yuniarti (2011), the audit should not only be of extremely high quality, it should also be completed expeditiously and economically. Additionally, quality control policies and procedures relating to the audit should be implemented both at the level of the audit firm and at the individual audit level (Yuniarti 2011). All audit firms must implement quality control policies and procedures which ensure that audits are performed by reference to approved auditing standards (Yahn-Shir, Joseph, Mei-Ting, & Ping-Sen 2013). Each audit firm should establish, and thereafter monitor, quality control policies and procedures, and communicate these to all audit partners and staff. The results of the PCA for the construct audit quality is presented in Table 7.17.

<table>
<thead>
<tr>
<th>Item- Audit Quality</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>The annual audit plan is determined completely by the audit director</td>
<td>0.705</td>
</tr>
<tr>
<td>The areas audited are very significant to the organisation</td>
<td>0.709</td>
</tr>
<tr>
<td>Internal auditors are able to cover all organisational units and all issues</td>
<td>0.629</td>
</tr>
<tr>
<td>The response of audited organisations to the audit is submitted in writing to the head of audit, and is relevant and comprehensive</td>
<td>0.713</td>
</tr>
<tr>
<td>The internal auditor also performs other activities such as developing procedures, and conducting economic and financial audits</td>
<td>-</td>
</tr>
<tr>
<td>There is regular follow-up by the audit manager to examine actions taken to correct problems identified</td>
<td>0.683</td>
</tr>
</tbody>
</table>
The six items for the audit quality construct were analysed using PCA with varimax rotation. The fifth item had a low communality at 0.260, and was removed for further analysis. The component loading of the remaining components were above 0.60. The Cronbach Alpha was tested, and the result was 0.720. As noted previously, a Cronbach Alpha value of above 0.70 is provides acceptable internal consistency. The next section explains the regression analysis performed to test the T-O-E-I Framework and the Audit Quality Framework developed in this study.

7.8 Regression Analysis

Regression analysis is a statistical method used to assess the relationship between a dependent variable and one or more independent variables (Hair, Black, Babin, Anderson, & Tatham 2009; Tabachnick et al. 2001). Regression analysis allows one to investigate and model the relationship between variables (Montgomery, Peck, & Vining 2015). The main difference between regression and correlation is that regression allows the development of a model that enables one to predict the dependent variables using a set of independent variables (Tabachnick and Fidell 2012; Hair et al. 2009). The importance of each of the independent variables in determining the value of the dependent variable is examined in regression analysis. Regression techniques also allow the examination of the impact of certain independent variables in predicting the dependent variables by statistically eliminating the effects of other independent variables (Tabachnick and Fidell 2012; Hair et al. 2009). For this reason, regression analysis can be used to examine whether the technological, organisational, environmental and individual factors can better predict the impact of technology adoption intention on audit quality. The primary goal of regression analysis is to identify the best model to predict the dependent variable (Sheldon, Davies and Howell 2012).
A standard ordinary least squares regression analysis is performed to test the core hypotheses for the second model which examines the impact of technology adoption of the internal auditor, and associated antecedents, on audit quality. This method facilitates the identification of the best model to predict the impact of technology adoption on audit quality. The dependent variable for the Audit Quality Framework is audit quality, and the independent variables are determined from the outputs of the binary logistic regression framework. One advantage of using regression techniques is that they allow one to understand and disentangle the relative effects of two or more independent variables on the dependent variable (Allen 1997; Tabachnick and Fidell 2012; Hair et al. 2009). Tabachnick and Fidell (2012) argue that regression analysis can create the best prediction model if the independent variables have a strong correlation with the dependent variable and are uncorrelated with other independent variables.

A regression analysis can be conducted on continuous or dichotomous independent variables (Darlington and Hayes 2016). When the variable is discrete it can be converted into a set of dichotomous variables to perform regression analysis (Tabachnick and Fidell 2012; Hair et al. 2009). Several assumptions must be made before performing regression analysis (Nugent, White, & Basham 2000). For example, one assumption is that all the independent variables are measured without error (Nugent et al. 2000). Another assumption is that the variables are at continuous levels (Allen 2007). Nugent et al. (2000) argue that any violation of the results can bias all the parameters in unpredictable ways leading to erroneous conclusions. In this study, the T-O-E-I Framework is examined using a logistical regression model, whilst the Audit Quality Framework is examined using
standard linear regression. The following sections explain binary logistic regression and

7.8.1 Binary Logistic Regression

Binary logistic regression is a quantitative statistical method used for analysing a dataset
in which there are one or more independent variables that determine an outcome (Cochran
2010). This technique is used to predict whether the presence or absence of the dependent
variable can be explained using independent or explanatory variables (Mesa 2004). A
binary categorical dependent variable can be predicted and explained using logistic
regression (Hair et al. 2009). The goal of logistic regression is to find the best fitting model
that can describe the probability of the presence of an outcome or characteristic from a set
of independent or explanatory variables (Hair et al. 2009). Thus, logistic regression can
estimate the relationship between a single non-metric binary dependent variable, and
multiple metric or non-metric independent variables (Hair et al. 2009).

Creating models based on existing data to predict the outcome of future events is one of
the primary practical advantages of logistic regression (Sulock 2009). Logistic regression
allows one to identify the best model that can describe the relationship between a
dependent variable and several independent variables (Ozdemir 2011). The dependent
variable is dichotomous, with dummy variables coded zero and one, based on the presence
or absence of an outcome (Davis & Offord 1997). Since the dependent variable is
dichotomous, the binary logistic regression is based on the probabilities associated with
the two values of the dependent variables that are zero and one (Davis and Offord 1997).
Thus, binary logistic regression is only suitable for the prediction of a dichotomous

230
dependent variable and cannot be used for dependent variables with three or more groups (Hair et al. 2009).

The independent variables of a binary logistic regression can be continuous, categorical, or binary (Hair et al. 2009). The probability of occurrence of a binary outcome in the presence of one or more continuous or categorical variables can be predicted using binary logistic regression (Ramos, Ollero, & Suárez-Llorens 2017). Logistic regression models, or logit analysis, is a combination of multiple regression and multiple discriminant analysis, which allows one to predict a single dependent variable from one or more independent variables (Hair et al. 2009). The difference between logistic regression and a discriminant analysis, is that logistic regression can accommodate independent variables of all data types, and the assumption of normality is not required in logistic regression (Hair et al. 2009). The main difference between multiple regression and logistic regression is the characteristic of the dependent variable (Hair et al. 2009). In logistic regression, the dependent variable is non-metric, as in discriminant analysis (Hair et al. 2009).

7.8.2 The Stages of Binary Logistic Regression
The model building process with binary logistic regression consists of six stages (Dierks 2017). The first stage is to establish the objectives. Logistic regression can achieve two research objectives (Hair et al. 2009; Tabachnick et al. 2001). These are, identifying the independent variable with group membership that has significant influence on the dependent variable, and establishing a classification system based on the group membership of independent variables (Hair et al. 2009, Tabachnick et al. 2001). The second stage entails ensuring that the particular research design and underlying assumptions are met. This includes the binary dependent variable. The two groups of
interest can be denoted with the values of zero and one respectively, to represent the binary
dependent variable. When the two groups represent an event or outcome, the positive
outcome is coded one and the negative outcome is coded zero. This is because in such
cases, the group codes assigned can impact the interpretation (Hair et al. 2009, Tabachnick
et al. 2001). Stage three is to verify the assumptions. Unlike other methods such as
discriminant analysis or multiple regression, there are no general assumptions required in
logistic regression (Hair et al. 2009, Tabachnick et al. 2001). The fourth stage entails the
estimation of the logistic regression model and assessing overall fit. A good fit for the
logistic regression model is assessed using pseudo $R^2$ values, or by examining predictive
accuracy using measures such as Chi-square based measures and the classification matrix
(Hair et al. 2009, Tabachnick et al. 2001). The fifth stage focuses on the interpretation of
the results from the logistic regression model. The coefficients for the independent
variables and the significance of the coefficients assessed using the Wald statistic, is
analysed and interpreted. The direction of the relationship is examined using the logistic
coefficient. The magnitude of the change in the probability of each independent variable
can be assessed using the exponentiated coefficients (Hair et al. 2009). The sixth and final
stage entails validation of the results. The most common method of result validation is
through the use of a validation sample, which is different to the analysis sample used to
estimate the model (Hair et al. 2009, Tabachnick et al. 2001). The following section
explains the method of calculating the probability of the regression through maximum
likelihood estimation.

7.8.3 Maximum Likelihood Estimation

The maximum likelihood function allows one to calculate the probability of the regression
parameter in predicting a particular value from the observed data (Ramos et al. 2017). In
binary logistic regression, the regression coefficients are obtained using the maximum likelihood estimation (Sulock 2009). The maximum likelihood estimation is performed with the regression parameters to predict the probabilities of the logistic regression (Ramos et al. 2017). In logistic regression, the parameters are chosen to maximise the likelihood of observing the sample value, rather than selecting parameters that reduce the sum of squared errors as in ordinary regression (Ramos et al. 2017). According to Hair et al., (2009) the sum of squared differences between the actual and predicted value of the dependent variable is not suitable in logistic regression due to the non-linear nature of the logistic transformation. The use of maximum likelihood estimation distinguishes logistic regression from other techniques, and this requires a larger sample size (Hair et al. 2009). A sample size of greater than 400 is recommended for using maximum likelihood estimation because larger sample sizes produce consistent probability estimates which are close to the true value of the parameter estimated (Lemeshow & Hosmer 1982). The next section explains the stepwise logistic regression which allows the identification of the best predictors in the model.

### 7.8.4 Stepwise Logistic Regression

Binary logistic regression allows the stepwise selection of the best predictors to be included in the model (Ozdemir 2011; Osborne 2008; Hubery 1989). This procedure begins with a model without any predictor variable, and in each step, a predictor variable with the largest score statistics and a significance value of less than 0.05 for a 95% confidence interval is added to the model (Osborne 2008). All independent variables with significance values greater than 0.05 are omitted from the analysis (Ozdemir 2011). This is because independent variables with significance values of greater than 0.05 have no statistically significant influence on the dependent variable (Simpson 2006). However, a key drawback
of the stepwise method is that it ignores the cumulative effect of the variable combinations (Thompson 2001). The next section explains the standard linear regression analysis used to test the Audit Quality Framework developed in this study.

7.9 Standard Linear Regression

A regression analysis was performed to test the hypotheses for the second model developed in this study, to examine the impact of the factors in the internal auditor’s technology adoption intention model on audit quality. This method facilitates the identification of the best model to predict the impact of technology adoption intention on audit quality. The dependent variable for the Audit Quality Framework is audit quality, and the independent variables are performance expectancy, time pressure, audit independence, pressure from management, top management support and auditor intention to adopt technology. The impact of technology adoption intention on performance expectancy, time pressure, audit independence, pressure from management and top management support, and their subsequent impact on audit quality is examined in this model. Accordingly, the primary goal of using the regression analysis in this study is to identify the best model to predict audit quality as a result of technology adoption intention.

One advantage of using regression analysis techniques is that it allows one to understand and disentangle the relative effects of two or more independent variables on the dependent variable (Allen, 1997; Tabachnick and Fidell, 2012; Hair et al. 2009). Thus, regression analysis allows one to identify the relationship between one dependent variable and several independent variables all at once (Allen, 1997). Tabachnick and Fidell (2012) argue that regression analysis can create the best prediction model if the independent
variables have a strong correlation with the dependent variables and are uncorrelated with other independent variables.

Regression analysis allows one to investigate and model the relationship between variables (Montgomery, Peck, & Vining 2015). The main difference between regression and correlation analysis is that regression analysis permits the development of a model that allows one to predict the dependent variables using a set of independent variables (Tabachnick and Fidell 2012; Hair et al. 2009). Therefore, the regression analysis method allows the prediction of audit quality based on the technology adoption intention of internal auditors. The degree to which an independent variable can predict the change in the dependent variable can be identified using parameter estimates in regression analysis (Anderson, Baker and Redington 2009). Parameter estimates refer to the un-standardised regression coefficients ($B$ weights) that explain the change in the dependent variable with one unit changes in one independent variable when all other independent variables are held constant (Tabachnick and Fidell 2012 Hair et al. 2009). Although regression analysis allows the prediction of the dependent variable from a set of independent variables, it does not imply that the relationships are causal (Tabachnick and Fidell 2012 Hair et al. 2009).

Regression analysis involves the evaluation of a number of parameters including the ratio of cases to independent variables, assumptions of normality, linearity, homoscedasticity and independence of residuals, as well as absence of multicollinearity and singularity (Tabachnick and Fidell 2012). The ratio of cases to independent variables refers to the sample size relative to the number of independent variables in a regression analysis (Pett 2015). When the number of cases to the independent variable is insufficient, this leads to standard errors and large parameter estimates (Pett 2015). The assumption of normality
suggests that the coefficient estimates of the sampling distribution is normally distributed (Berry 1993). The assumption of normality is more important when the sample size is small and it allows one to justify the regression (Berry 1993). The assumption of linearity indicates that there is a linear relationship between the dependent and the independent variable (Hahs-Vaughn and Lomax 2013). Homoscedasticity denotes the homogeneity of variance and means that the variance of each population is equal (Hahs-Vaughn and Lomax 2013). The concept of multicollinearity signifies that the two or more explanatory variables in a regression equation are highly correlated (Albright, Winston and Zappe 2008), whilst singularity indicates that the variables are redundant (Dziuda 2010).

The normality, linearity, homoscedasticity, and absence of multicollinearity and singularity of the independent variables of the audit quality framework were examined when conducting the linear regression. The normality was assessed using the normal probability plot. Figure 7.1 shows the normal P-P plot which shows a diagonal line of values that follows the normality line. Since the values follows the normality line, the normality assumption can be confirmed for the regression model to predict audit quality. Thus, there is linear relationship between the independent variables and the dependent variable namely, audit quality.
The test for homoscedasticity is obtained in a scatter plot. The scatter plot is given in Figure 7.2. Homoscedasticity means that the variances remain similar as it moves along the best line of fit. The data points in the scatter plot are very similar and hence, the assumption of homoscedasticity can be confirmed.
The results of the multicollinearity were obtained from the collinearity statistics taken from the linear regression. The absence of multicollinearity was assessed using the Variance Inflation Factor (VIF) values in the coefficients table obtained in linear regression. The collinearity statistics with the VIF values for the independent variables of audit quality are given in Table 7.18. The results from the collinearity statistics indicate that there is no symptom of multicollinearity in the data, as the VIF values were between 1 and 10 (Tabachnik & Fidell, 2012).
<table>
<thead>
<tr>
<th>Table 7.18 Collinearity Statistics to test Multicollinearity</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIF</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Performance Expectancy (PE)</td>
</tr>
<tr>
<td>Time Pressure Evidence (TP1)</td>
</tr>
<tr>
<td>Time Pressure Performance (TP2)</td>
</tr>
<tr>
<td>Audit Independence Budget (IND1)</td>
</tr>
<tr>
<td>Audit Independence Planning (IND2)</td>
</tr>
<tr>
<td>Pressure from Management (PM)</td>
</tr>
<tr>
<td>Top Management Support for Skills Development (TMS1)</td>
</tr>
<tr>
<td>Top Management Support for Meeting Needs (TMS2)</td>
</tr>
<tr>
<td>CAAT Adoption</td>
</tr>
<tr>
<td>Audit Duration</td>
</tr>
<tr>
<td>Audit Experience</td>
</tr>
<tr>
<td>Team Size</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Qualifications</td>
</tr>
</tbody>
</table>

The required sample size depends on the number of predictor variables, desired power, alpha level, and the expected effect sizes (Tabachnick and Fidell 2012; Hair et al. 2009). In this context, predictor variables represent independent variables, and the expected effect size represents the size of the regression coefficient. Additionally, the desired power refers to the probability of finding a result if the expected effect size exists within the population (Miles and Shevlin 2000). The alpha level refers to the level of significance. For example, an alpha level of less than 0.05 is considered significant (Gideon 2012). The rule of thumb calculation for the number of cases to test the regression is \( N \geq 50 + 8m \), where \( m = \) number
of independent variables. So, if there are five predictors, there will be $50 + (8 \times 5) = 90$
cases.

However, when the dependent variable is skewed, or not normally distributed, a higher
number of cases to independent variable ratio is needed (Tabachnick and Fidell 2012; Hair
et al. 2009). The analysis of the residuals were performed to assess the normality, linearity
and homoscedasticity of the residuals. The residual scatterplots can test the assumption of
normality, linearity and homoscedasticity between the predicted dependent values score,
and the errors in the prediction (Tabachnick and Fidell 2012; Hair et al. 2009). When
performing regression analysis it is important to remove any singular or multicollinear
independent variables (Lawrence, Klimberg and Lawrence 2009). Multicollinearity can
lead to large standard error for regression coefficients, and for this reason the independent
variables should not be multicollinear (Tabachnick and Fidell 2012; Hair et al. 2009). In
order to test for collinearity, a bivariate correlation was calculated for all the composite
variables generated from the factor analysis phase. Correlations were not very high
(maximum 0.497) except where there were two factors that were related (for example the
two independence factors), and so the data is not linearly dependent. Table 7.19 and Table
7.20 show the correlation tables when the dependent variable was internal auditor intention
to adopt technology and audit quality respectively.
Table 7.19 Correlation Table for Intention to Adopt

<table>
<thead>
<tr>
<th>Auditor Intention to adopt technology</th>
<th>Pearson Correlation</th>
<th>Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management Support for Skills Development (TMS1)</td>
<td>-0.106*</td>
<td>.045</td>
</tr>
<tr>
<td>Top Management Support for Meeting Needs (TMS2)</td>
<td>.067</td>
<td>.211</td>
</tr>
<tr>
<td>Pressure from Management (PM)</td>
<td>.060</td>
<td>.263</td>
</tr>
<tr>
<td>Technology Readiness Innovativeness (TR_INN)</td>
<td>0.211**</td>
<td>.000</td>
</tr>
<tr>
<td>Technology Readiness Optimism (TR_OPT)</td>
<td>.015</td>
<td>.783</td>
</tr>
<tr>
<td>Technology Readiness Insecurity (TR_INS)</td>
<td>.039</td>
<td>.467</td>
</tr>
<tr>
<td>Technology Readiness Discomfort (TR_DIS)</td>
<td>-.019</td>
<td>.727</td>
</tr>
<tr>
<td>Time Pressure Evidence (TP1)</td>
<td>.185**</td>
<td>.000</td>
</tr>
<tr>
<td>Time Pressure Performance (TP2)</td>
<td>.076</td>
<td>.154</td>
</tr>
<tr>
<td>Audit Independence Budget (IND1)</td>
<td>.090</td>
<td>.090</td>
</tr>
<tr>
<td>Audit Independence Planning (IND2)</td>
<td>.065</td>
<td>.225</td>
</tr>
<tr>
<td>Technology Benefits (TB)</td>
<td>.096</td>
<td>.070</td>
</tr>
<tr>
<td>Technology Risks (TR)</td>
<td>-.123**</td>
<td>.021</td>
</tr>
<tr>
<td>Social Influence Personal (SI_1)</td>
<td>.076</td>
<td>.152</td>
</tr>
<tr>
<td>Social Influence Organisational (SI_2)</td>
<td>.091</td>
<td>.087</td>
</tr>
<tr>
<td>Facilitating conditions (FC)</td>
<td>.128*</td>
<td>.016</td>
</tr>
<tr>
<td>Performance Expectancy (PE)</td>
<td>.123*</td>
<td>.021</td>
</tr>
<tr>
<td>Effort Expectancy (EE)</td>
<td>.222</td>
<td>.000</td>
</tr>
</tbody>
</table>
Table 7.20 Correlation Table for the Factors Influencing Audit Quality

<table>
<thead>
<tr>
<th>Audit Quality</th>
<th>Pearson Correlation</th>
<th>Sig 2-tailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectancy (PE)</td>
<td>.323**</td>
<td>.000</td>
</tr>
<tr>
<td>Time Pressure Evidence (TP1)</td>
<td>.299*</td>
<td>.000</td>
</tr>
<tr>
<td>Time Pressure Performance (TP2)</td>
<td>.191**</td>
<td>.000</td>
</tr>
<tr>
<td>Audit Independence Budget (IND1)</td>
<td>.261**</td>
<td>.000</td>
</tr>
<tr>
<td>Audit Independence Planning (IND2)</td>
<td>.353**</td>
<td>.000</td>
</tr>
<tr>
<td>Pressure from Management (PM)</td>
<td>.479**</td>
<td>.000</td>
</tr>
<tr>
<td>Top Management Support for Skills Development (TMS1)</td>
<td>.027</td>
<td>.610</td>
</tr>
<tr>
<td>Top Management Support for Meeting Needs (TMS2)</td>
<td>.413**</td>
<td>.000</td>
</tr>
<tr>
<td>CAAT Adoption</td>
<td>.031</td>
<td>.561</td>
</tr>
</tbody>
</table>

The next section presents the hypotheses testing for the T-O-E-I Framework using binary logistic regression. It also shows the revised model.

7.10 Logistic Regression of T-O-E-I Framework

Binary logistic regression allows one to predict whether the observation falls into one of the two categories of the dependent variable with one unit change in an independent variable when all other units are held constant (Pampel 2000). In the T-O-E-I Framework, the dependent variable is the internal auditor’s intention to adopt CAAT technology for internal auditing. The independent variables for the T-O-E-I Framework are the technological factors, organisational factors, environment factors and individual factors. The proposed T-O-E-I Framework for this research is given in Figure 7.3.
7.10.1 Sample Size Cases per Variable

Logistic regression is the most commonly used model by accounting researchers to predict an event or a situation (Ge and Whitmore 2010). This study which examines whether internal auditors adopt technology or not is also a prediction model. A logistic regression model is considered to be the most suitable model for a binary dependent variable even when the sample size is small (Ge and Whitmore 2010). The sample size for the study is
The suitability of the sample size is based on the number of independent and control variables in the logit model. The basic rule of thumb in sample size determination is to have 10 cases per variable in the model (Tabachnik & Fidell, 2012). In this research, there are a total of 23 variables including 18 factors and five control variables. Thus, in this research there are 15.4 cases per variable (355/23). Therefore, the cases per variable in this research is higher than the rule of thumb in sample size determination. Although the rule of thumb states 10 cases per variable, it is useful to examine the number of variables, number of factors and cases per variables for logistic regression in different accounting studies to identify the typical pattern of cases per variable used in accounting and auditing studies.

The study by Chang, Luo and Zhou (2017) which examined the association between audit deficiency and work load in public accounting firms used in logistic regression model with 14 independent variables. The sample size of that study was 982. Ameur, Bouafi, Rostan, Theoret and Trabelsi (2007) used logistic regression to determine the predictive ability of financial ratios in the context of bankruptcy. The model in that study consisted of 34 financial ratios, two firm size variables and dummy variables for industry effects. Thus, there were more than 40 variables in the model. The sample size of that study included 614 listed companies in the US. There are also studies which have sample size which is lower than the basic rule of thumb of 10 cases per variable. Butcher, Harrison and Ross (2013) conducted a logistic regression to identify the audit quality factors that influence auditor retention. The logistic regression model consisted of 48 independent variables but the sample size of the study consisted only of 235 finance professionals. However, as per the basic rule of thumb for sample size, this should have been 480 because there are 48 independent variables.
Ronokko, Paananen and Vakkuri (2017) utilised a binary logistic regression model to examine the impact of ownership structure on the use of internal audit. The model was based on data from 107 listed firms on the NASDAQ OMX Helsinki and comprised 21 independent and control variables. However, the model was sensitive to the proxy for size which was measured as the total number of employees. A logistic regression was also used in a study by Abdel-Meduid, Samaha and Dahawy (2014) to examine the impact of non-audit committee corporate governance attributes on audit committee functionality in Egypt. Their model consisted of 10 variables including independent and control variables and a sample size of the top 100 companies listed on the Egyptian Stock Exchange.

The logistic regression model used in the study by Heliodoro, Carreira and Lopes (2016) to examine the impact of qualified audit opinions on change in auditors consisted of four independent variables with a set of 337 observations from 57 entities. Carey, Subramaniam and Ching (2006) used logistic regression to analyse the independent variables that influence the internal audit outsourcing decision. Their model consisted of four independent variables, and survey data from 99 listed companies on the Australian Stock Exchange was used to identify the determinants of the internal audit outsourcing decision. A logistic regression was used by Chang, Luo, and Zhou (2017) to examine the impact of the workload of the firm on audit deficiency. The sample for that study included 982 PCAOB inspection releases from 2004 to 2013, and there were 14 independent variables in the model. Logistic regression was performed by Mande and Son (2011) to examine the impact of audit delays on auditor change. Their sample consisted of 11,307 observations and there were 11 independent variables in the model. Table 7.21 summarises details on sample size, number of variables and cases per variable in the logistic regression models used in previous accounting and auditing studies.
<table>
<thead>
<tr>
<th>Citation</th>
<th>Sample Size</th>
<th>Number of Variables</th>
<th>Cases per Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee et al. (1999)</td>
<td>56</td>
<td>21</td>
<td>2.7</td>
</tr>
<tr>
<td>Butcher, Harrison and Ross (2013)</td>
<td>235</td>
<td>48</td>
<td>4.95</td>
</tr>
<tr>
<td>Ronokko, Paananen and Vakkuri (2017)</td>
<td>107</td>
<td>21</td>
<td>5.09</td>
</tr>
<tr>
<td>Bell and Tabor (1991)</td>
<td>131</td>
<td>24</td>
<td>5.45</td>
</tr>
<tr>
<td>Heliodoro, Carreira and Lopes (2016)</td>
<td>337</td>
<td>57</td>
<td>5.9</td>
</tr>
<tr>
<td>Roberts et al. (1990)</td>
<td>87</td>
<td>9</td>
<td>9.6</td>
</tr>
<tr>
<td>Abdel-Meduid, Samaha and Dahawy (2014)</td>
<td>100</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Mutchler et al. (1997)</td>
<td>208</td>
<td>15</td>
<td>13.8</td>
</tr>
<tr>
<td>Krishnan and Krishnan (1997)</td>
<td>141</td>
<td>10</td>
<td>14.1</td>
</tr>
<tr>
<td>Bonner et al. (1998)</td>
<td>261</td>
<td>18</td>
<td>14.5</td>
</tr>
<tr>
<td>Ghicas (1990)</td>
<td>134</td>
<td>9</td>
<td>14.8</td>
</tr>
<tr>
<td>Beasley (1996)</td>
<td>150</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Ameur, Bouafi, Rostan, Theoret and Trabelsi (2007)</td>
<td>614</td>
<td>40</td>
<td>15.35</td>
</tr>
<tr>
<td>Choi et al. (1997)</td>
<td>336</td>
<td>14</td>
<td>24</td>
</tr>
<tr>
<td>Carey, Subramaniam and Ching (2006)</td>
<td>99</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>Chen and Wei (1993)</td>
<td>128</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Erickson (1998)</td>
<td>340</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>Penman (1992)</td>
<td>1482</td>
<td>28</td>
<td>52</td>
</tr>
<tr>
<td>Carcello and Palmrose (1994)</td>
<td>655</td>
<td>12</td>
<td>54</td>
</tr>
<tr>
<td>Hackenbrack et al. (2000)</td>
<td>675</td>
<td>10</td>
<td>67.5</td>
</tr>
<tr>
<td>Chang, Luo and Zhou (2017)</td>
<td>982</td>
<td>14</td>
<td>70.14</td>
</tr>
<tr>
<td>Jeter and Shaw (1995)</td>
<td>787</td>
<td>10</td>
<td>78.7</td>
</tr>
<tr>
<td>Menon and Williams (1991)</td>
<td>1320</td>
<td>12</td>
<td>110</td>
</tr>
<tr>
<td>Schwartz and Soo (1996)</td>
<td>3078</td>
<td>17</td>
<td>181</td>
</tr>
<tr>
<td>Frankel et al. (2002)</td>
<td>3074</td>
<td>9</td>
<td>341</td>
</tr>
<tr>
<td>Mande and Son, (2011)</td>
<td>11,307</td>
<td>11</td>
<td>1027</td>
</tr>
<tr>
<td>Mikhail et al. (1999)</td>
<td>5,434</td>
<td>5</td>
<td>1086</td>
</tr>
<tr>
<td>Chaney et al. (1997)</td>
<td>12,442</td>
<td>11</td>
<td>1,131</td>
</tr>
<tr>
<td>Bushee (1998)</td>
<td>13,944</td>
<td>11</td>
<td>1267</td>
</tr>
</tbody>
</table>

An examination of each of these studies which used logistic regression indicate that the cases per variable ranged from 2 to 1131. The median for the cases per variable in logistic regression for all these studies is 24. This suggests that on average, previous accounting
and auditing studies had 24 cases per variable for logistic regression which is higher than the cases per variable for this research at 15.

7.10.2 Dependent Variable

The dependent variable in this study is Q2. Three options were available (Q1, Q2 and Q3). Q2 offered the maximum variation, and is the most likely response. Table 7.22 shows the frequency of the responses to Q1, “I intend to use CAATs in the next year if they become available in my organisation”, Q2, “I predict that I would use CAATs in the next year if they became available in my organisation”, and Q3, “I plan to use CAATs in the next year if they become available in my organisation”. The frequency distribution for the three questions used to measure the internal auditor’s intention to adopt technology show that Q2 had closer representation in each category. For example, the percentage of people who said “no” to their intention to adopt technology to Q1 and Q3 was only 7.3% and 10.7% respectively. Q2 had more representation of people who said no (18.9%). Thus, it is clear that Q2 is the question with the most variation, so it was used.

Table 7.22 Distribution of Dependent Variable CAAT Adoption

| Q1, “I intend to use CAATs in the next year if they become available in my organisation” | Yes  | 329  | 92.7% |
| Q1, “I intend to use CAATs in the next year if they become available in my organisation” | No   | 26   | 7.3%  |
| Q2, “I predict that I would use CAATs in the next year if they became available in my organisation” | Yes  | 288  | 81.1% |
| Q2, “I predict that I would use CAATs in the next year if they became available in my organisation” | No   | 67   | 18.9% |
| Q3 “I plan to use CAATs in the next year if they become available in my organisation” | Yes  | 317  | 89.3% |
| Q3 “I plan to use CAATs in the next year if they become available in my organisation” | No   | 38   | 10.7% |
As a result, the binary logistic regression results reveal which variables and controls drive the likelihood of CAATs adoption if CAATs were available in the organisation. For the logistic regression analysis, Q1, Q2 and Q3 were reverse scored, such that the value 1 denoted ‘No’ and the value 2 denoted ‘Yes’. The next section presents the results of the logistic regression analysis of the T-O-E-I Framework. The full model is also run with the Q1 and Q3 on internal auditors’ intention to adopt technology to test if using Q2 as the dependent variable was the best option.

7.10.3 Outcomes

The binary logistic regression for the T-O-E-I Framework examined 23 variables including factor variables and control variables. A total of 341 (96.1%) cases were included for analysis as the remaining 14 (3.9%) cases were missing. The two decision options for internal auditors on whether they would use CAATs if made available in their organisations were ‘no’ and ‘yes’. The BLOCK 0 output from logistic regression indicates that the best strategy to predict is that the subject (here, internal auditors) will decide to use CAATs if made available in their organisation in the next year, as this prediction will be correct 80.9% (276/341) of the time. 276 subjects out of the 341 completed cases answered ‘yes’, that they will use CAATs if made available in their organisation in the next year. This is the null model with no predictor variables. This means that without the influence of any independent variables, 80.9% of the time it will be correct if the prediction is that the internal auditors will decide to use CAATs.

The omnibus tests of model coefficient in the binary logistic regression analysis allows one to measure the validity of the T-O-E-I Framework with the full set of independent variables. The chi-square values of the constant only model and full model with predictors...
and constant allows one to understand whether the prediction is better with or without the predictor variables (Meyers, Gamst and Guarino 2006). The chi-square value in the omnibus tests of model coefficients is 60.108 based on 23 degrees of freedom with a statistical significance of 0.000. The value of 60.108 is the chi-squared difference between the model with only the constant and the full model. The chi-square model reflects whether the model that includes the full set of independent variables results in significant improvements in the prediction of the independent variable when compared to the null model. The statistical significance (sig < 0.01) of the chi-square test indicates that the full model results in a significant improvement in the prediction of the dependent variables namely, internal auditor’s intention to adopt audit technology.

The model summary is a goodness of fit statistic that allows one to measure the validity of the model (Meyers et al. 2006). The model summary also allows one to compute the pseudo $R^2$ which is an absolute measure of the validity of the T-O-E-I Framework measured through Cox and Snell and the Nagelkerke tests. The Nagelkerke $R^2$ test is analogous to the $R^2$ generated in the multiple regression analysis and is within a range of 0-1. These values allow one to determine the percentage variance in the dependent variables caused by the independent variables in the binary logistic regression (Meyers et al. 2006). Since the Nagelkerke R2 test is 0.260, which is higher than 0, this indicates that the full model leads to approximately 26% of the variance in the dependent variable.

The binary logistic regression shows the Hosmer and Lemeshow test which is also a chi-square test. The main difference associated with this chi-square test compared to the omnibus tests of model coefficient is that in this test the non-significance is used to predict the goodness of fit. The chi-square value of the Hosmer and Lemeshow test is 8.930 with
a significance value of 0.348. Since the value is greater than 0.05, it is indicative of non-significance and this indicates that the model with independent variables is a good fit. The non-significance is also indicative that the predicted probabilities in the model are the same as the observed probabilities from the dataset. Thus, the results suggest a good overall fit of the model in predicting the internal auditor’s intention to adopt technology. The subsequent result of the binary logistic regression is the fit within the model based on the individual independent variables used in the model. The predictive accuracy of the model is 83.3% and is better in predicting the internal auditors who are willing to adopt technology (97.1% accuracy), rather than predicting internal auditors who are not willing to adopt technology (24.6% accuracy).

The predictors of the T-O-E-I Framework were Technological Benefits (TB), Technological Risks (TR), Top Management Support for Skills Development (TMS1), Top Management Support for meeting needs (TMS2), Pressure from Management (PM), Time Pressure on Evidence (TP1), Time Pressure on Performance (TP2), Audit Independence on Budgets (IND1), Audit Independence on Planning IND2, TRI Innovativeness, TRI Optimism, TRI Insecurity, TRI Discomfort, Performance Expectancy (PE), Effort Expectancy (EE), Facilitating Conditions (FC), Social Influence Personal (SIP), Social Influence Organisational (SIO), Audit Duration, Age, Gender (coded 1= Male, 2 = Female), Qualification and Team size.

Table 7.23 presents the variables in the equation table obtained from the binary logistic regression. This table demonstrates the contribution of all the independence variables to the model, and their statistical significance (Bryman and Cramer 2015). The statistical
significance of each of the independent variables is observed through the Wald test, and the statistical significance of the model is observed through the significance tests.

**Table 7.23 Variables in the Equation Binary Logistic Regression T-O-E-I**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Benefits (TB)</td>
<td>-.160</td>
<td>.184</td>
<td>.757</td>
<td>1</td>
<td>.384</td>
<td>.852</td>
</tr>
<tr>
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<td>.180</td>
<td>3.375</td>
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<td>.066</td>
<td>.718</td>
</tr>
<tr>
<td>Top Management Support for Skills Development (TMS1)</td>
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<td>1.038</td>
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<tr>
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<td>1.697</td>
</tr>
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<td>1.018</td>
</tr>
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<td>.802</td>
<td>1.047</td>
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<tr>
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<td>.006</td>
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<td>.940</td>
<td>.986</td>
</tr>
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<td>.008</td>
<td>1.686</td>
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<td>.673</td>
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<td>.412</td>
<td>.853</td>
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<td>TRI Insecurity</td>
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<td>.600</td>
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<td>.439</td>
<td>1.145</td>
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<tr>
<td>TRI Discomfort</td>
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<td>.183</td>
<td>.102</td>
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<td>.750</td>
<td>1.060</td>
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<tr>
<td>Performance Expectancy (PE)</td>
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<td>.160</td>
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<td>.207</td>
<td>2.842</td>
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<tr>
<td>Facilitating Conditions (FC)</td>
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<td>.949</td>
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<tr>
<td>Social Influence Personal (SIP)</td>
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<td>.178</td>
<td>.109</td>
<td>1</td>
<td>.742</td>
<td>.943</td>
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<td>Social Influence Organisational (SIO)</td>
<td>.091</td>
<td>.163</td>
<td>.308</td>
<td>1</td>
<td>.579</td>
<td>1.095</td>
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</table>
Table 7.23 shows the variables in equation table from SPSS with the regression coefficient (B), the Wald statistics, significance level and odds ratio (Exp (B)). The regression coefficient (B) of each of the independent variables is the predicted change in the dependent variable for every one unit increase in the independent variable. The T-O-E-I Framework aims to predict the probability of falling into the group where the internal auditors are willing to adopt CAATs. The Wald test estimates the chi-square of the distribution based on the estimated regression coefficients and their standard errors (Humphreys and Riddoch 2016). The statistical significance is estimated at 0.1. The Wald test reports that Technological Risks (TR), Top Management Support for Skills Development (TMS1), Time Pressure on Evidence (TP1), TRI Innovativeness, Effort Expectancy (EE) and Audit Duration are statistically significant predictors of internal the auditor’s intention to adopt technology.

Technological risks had a significance value of 0.066 which suggests that when all other predictors are held constant, there is a statistically significant relationship between the
internal auditor’s perception of technological risks and their intention to adopt technology. The regression coefficient of technology risk is -0.331, which suggests that the higher the internal auditor’s perception about technology risks, the less likely they are to adopt internal auditors’ technology. Top Management Support for Skills Development had a statistically significant relationship (p= 0.025) with the internal auditor’s intention to adopt technology, which suggests that when all other predictors are held constant, Top Management Support for Skills Development influences the decision of the internal auditor to adopt CAATs. The regression coefficient of Top Management Support for Skills Development is -0.409, which suggests that internal auditors who consider that top management support them in their skill development are less likely to adopt CAATs.

Time Pressure Evidence had a statistically significant association (B = 0.529, p= 0.014) with the internal auditor’s intention to adopt technology. This means that when all other variables were held constant, the increase in the time pressure on evidence increased the internal auditor’s likelihood of adopting CAATs. The Technology Readiness Innovativeness had a statistically significant positive impact on the internal auditor’s intention to adopt technology (B= 0.522, P = 0.008). This suggests that when all other predictor variables were held constant, the increase in innovativeness under the technology readiness index increased the internal auditors’ likelihood of adopting technology. Effort Expectancy had a statistically significant positive impact on the internal auditor’s intention to adopt technology (B =0.348, p = 0.092). This means that when all other variables were held constant, the increase in effort expectancy increased the likelihood of internal auditors adopting CAATs.
The results from the binary logistic regression of the T-O-E-I Framework are provided in Table 7.24. The results of the variables in the equation table show that technological benefits, top management support, time pressure on evidence, individual readiness on innovativeness and effort expectancy were the main variables identified to add significantly to the model. The control variables of age \((p = .366)\), gender \((p = .101)\), qualifications \((p = .487)\) and team size \((p = .231)\) were not identified to have any statistically significant impact on the model. The control variable audit duration \((p = .001)\) had a statistically significant impact on the model. The next section explains whether the statistically significant association identified from the binary logistic regression confirms the hypotheses. Table 7.24 also provides a summary of the hypotheses, standardised path relationships, t-value and p-values. It also clearly states if the hypotheses are supported or not supported.

**Table 7.24 Logistic Regression Results:**

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Path</th>
<th>Standardised Loadings</th>
<th>t-value</th>
<th>p-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Technology benefits – technology adoption</td>
<td>-.160</td>
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<td>.384</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H2</td>
<td>Technology risks – technology adoption</td>
<td>-.331</td>
<td>3.375</td>
<td>.066</td>
<td>Supported</td>
</tr>
<tr>
<td>H3a</td>
<td>Top management support for skills development – technology adoption</td>
<td>-.409</td>
<td>5.002</td>
<td>.025</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H3b</td>
<td>Lack of top management support for meeting needs – technology adoption</td>
<td>-.035</td>
<td>.033</td>
<td>.857</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H4</td>
<td>Pressure from management – technology adoption</td>
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<td>.033</td>
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<td>H5a</td>
<td>Time pressure on evidence – technology adoption</td>
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<td>6.051</td>
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<td>Supported</td>
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<tr>
<td>H5b</td>
<td>Time pressure on performance – technology adoption</td>
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<td>.009</td>
<td>.923</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H6a</td>
<td>Audit independence budgets - technology adoption</td>
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<td>.063</td>
<td>.802</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H6b</td>
<td>Audit independence planning - technology adoption</td>
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<td>.006</td>
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</tr>
<tr>
<td>H7a</td>
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<td>.008</td>
<td>Supported</td>
</tr>
<tr>
<td>H7b</td>
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<td>.673</td>
<td>.412</td>
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<td></td>
<td>Hypothesis</td>
<td>Description</td>
<td>Beta</td>
<td>SE</td>
<td>p-value</td>
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<td>-------------</td>
<td>------</td>
<td>----</td>
<td>---------</td>
</tr>
<tr>
<td>H7c</td>
<td>Technology readiness on Optimism - technology adoption</td>
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<td>0.600</td>
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<td>Not Supported</td>
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<tr>
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<td>Supported</td>
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<td>H10a</td>
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</tbody>
</table>

7.11 Alternative Modelling

The logistic regression was also run with Q1 and Q3 representing different measures of adoption. However, the models performed poorly, as the percentage of positive responses was higher than in Q2. This section presented the results of the binary logistic regression with the dependent variable Q1 “I intend to use CAATs in the next year if they become available in my organisation”.

When the dependent variable was Q1, the binary logistic regression with 23 variables showed different results as presented in Table 7.25. A total of 341 cases were analysed. The chi-square value of the omnibus test of model coefficient was 40.075, with a statistical significance of 0.015. This shows that the difference between the constant only model and the full model was 40.075. Although the full model increased the prediction of the dependent variable (Q1) by 40.075, the prediction with the full model was higher (60.108.) when the dependent variable was Q2. The Nagelkerke R2 test with dependent variable Q1 was 0.278 which indicates that the full model with all predictors determined 27.8% of the variance in the dependent variable Q1.
Table 7.25 Binary Logistic Regression with Q1

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
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</thead>
<tbody>
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<td>.953</td>
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<td>Time Pressure on Performance (TP2)</td>
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<td>1.370</td>
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<tr>
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<td>.083</td>
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<td><strong>.021</strong></td>
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<table>
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<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
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<td>.108</td>
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</tr>
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<td>.169</td>
<td>1</td>
<td>.681</td>
<td>.890</td>
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<td>.940</td>
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<td>.332</td>
<td>.617</td>
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<td><strong>.004</strong></td>
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<td>.281</td>
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<td>.596</td>
<td>1.183</td>
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<tr>
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<td>.092</td>
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<td>.762</td>
<td>1.471</td>
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</tbody>
</table>

Table 7.25 shows the variables in equation from the binary logistic regression with the dependent variable Q1. A different set of independent variables were identified to be of
statistical significance in predicting the dependent variable Q1. The variables found to significantly predict the dependent variable Q1 at a p level of 0.1 were top management support for skill development, technology readiness index discomfort, social influence organisational and qualifications. Top management support for skill development and technology readiness index discomfort both had a statistically significant negative relationship with dependent variable Q1, which suggests that the increase in top management support for skills development and the increase in discomfort decrease the likelihood of the internal auditor adopting CAATs. Top management support for skills development therefore has a statistically significant negative association when the dependent variable was Q1 and also Q2. The variables social influence organisational and qualification had a statistically significant positive relationship with the dependent variable (Q1). This suggests that the increase in social influence organisational and higher academic qualifications increase the likelihood of internal auditors adopting technology (Q1).

The logistic regression with Q3 which was “I plan to use CAATs in the next year if they become available in my organisation”, gave a different set of results per Table 7.26. This section presents the results of the binary logistic regression with all 23 variables and the dependent variable, Q3.

A total of 341 cases were analysed. The chi- square values of the omnibus test of model coefficient was 35.474, with a statistical significance of 0.047. This shows that the difference between the constant only model and full model was 35.474. This suggests that the model is a good fit to predict the dependent variable Q3. Although the full model increased the prediction of the dependent variable Q1 by 35.474, again the prediction with
the full model was higher when the dependent variable was Q2 (60.108) and Q1 (40.075).
The Nagelkerke R2 test with dependent variable Q3 was 0.201 which indicates that the full model with all predictors determined 20% of variance in the dependent variable, Q3. The Nagelkerke R2 test was lower when the dependent variable was Q3 compared to when the dependent variable was Q2 (26%) and Q1 (27.8%). The chi-square value of the Hosmer and Lemeshow test was 4.080 with a significance value of 0.850. This indicates a good overall fit of the model due to the non-significance. The results of the variables in the equation are given in Table 7.26.

Table 7.26 Binary Logistic Regression with Q3

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Benefits (TB)</td>
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<td>.227</td>
<td>1.189</td>
<td>1</td>
<td>.275</td>
<td>.781</td>
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<tr>
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<td>.556</td>
<td>1</td>
<td>.456</td>
<td>.837</td>
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<td>.133</td>
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<td>.715</td>
<td>1.096</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Pressure from Management (PM)</td>
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<td>.292</td>
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<tr>
<td>Time Pressure on Evidence (TP1)</td>
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<td>.377</td>
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<td>.539</td>
<td>1.139</td>
</tr>
<tr>
<td>Time Pressure on Performance (TP2)</td>
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<td>.088</td>
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<td>.767</td>
<td>1.069</td>
</tr>
<tr>
<td>Audit Independence on Budgets (IND1)</td>
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<td>.254</td>
<td>1.482</td>
<td>1</td>
<td>.223</td>
<td>1.362</td>
</tr>
<tr>
<td>Audit Independence on Planning IND2</td>
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<td>.217</td>
<td>.208</td>
<td>1</td>
<td>.648</td>
<td>1.104</td>
</tr>
<tr>
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<td>.232</td>
<td>.375</td>
<td>1</td>
<td>.540</td>
<td>.867</td>
</tr>
<tr>
<td>TRI Optimism</td>
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<td>.243</td>
<td>1.312</td>
<td>1</td>
<td>.252</td>
<td>.757</td>
</tr>
<tr>
<td>TRI Insecurity</td>
<td>-.329</td>
<td>.223</td>
<td>2.169</td>
<td>1</td>
<td>.141</td>
<td>.720</td>
</tr>
<tr>
<td>TRI Discomfort</td>
<td>-.097</td>
<td>.217</td>
<td>.202</td>
<td>1</td>
<td>.653</td>
<td>.907</td>
</tr>
<tr>
<td>Performance Expectancy (PE)</td>
<td>.071</td>
<td>.219</td>
<td>.104</td>
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<td>.747</td>
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<td>.442</td>
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<tr>
<td>Facilitating Conditions (FC)</td>
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<td>.455</td>
<td>1</td>
<td>.500</td>
<td>1.171</td>
</tr>
<tr>
<td>Social Influence Personal (SIP)</td>
<td>.227</td>
<td>.272</td>
<td>.699</td>
<td>1</td>
<td>.403</td>
<td>1.255</td>
</tr>
<tr>
<td>Social Influence Organisational (SIO)</td>
<td>-.102</td>
<td>.266</td>
<td>.148</td>
<td>1</td>
<td>.700</td>
<td>.903</td>
</tr>
</tbody>
</table>
Table 7.26 shows the variables in equation from the binary logistic regression with the dependent variable as Q3. A different set of independent variables were identified to be statistically significant in predicting the dependent variable Q3. The variables that significantly predict the dependent variable Q3 at p level of 0.1 are top management support for meeting needs, audit duration, age and qualifications. Age had a statistically significant negative relationship with the dependent variable, Q3. This suggests that increases in age decreases the intention of internal auditors to adopt CAATs. All the other variables including top management support for meeting needs, audit duration and qualifications were identified to have a statistically significant positive relationship with the internal auditor’s intention to adopt CAATs. Top management support for meeting needs was measured negatively as it reflects the extent to which top management do not meet the needs of the respondents. A positive association therefore means that the higher the top management not meeting the needs of the respondents; the less likely the respondents are to adopt CAAT. The positive significant association of audit duration and qualification suggests that higher the qualification and higher the audit duration, the internal auditors are more likely to adopt CAAT (Q3).

A comparison of binary logistic regression with the three different questions for the dependent variable for the internal auditor’s intention to adopt technology (Q1, Q2, and Q3) showed that although all three variables were identified to be models of good fit, the
independent variables showed maximum variance in the dependent variable when the dependent variable was Q2.

While the focus of this thesis is on the T-O-E-I Framework as a whole, it may be that by including the different factors individually we might be able to consider how different elements of the T-O-E-I Framework work differently on their own rather than together.

7.12 Discussion of Outcomes

Table 7.23 shows that the standardised loading score for the association between technology risks and technology adoption as -0.331. This suggests that there is a statistically significant negative association between technology risks and technology adoption. This means, the higher the level of technological risks, the lower will be the internal auditor’s intention to adopt CAATs. Thus, the hypothesis “The higher the level of perceived technological risks, the lower will be the internal auditor’s intention to adopt CAATs” (H2) can be confirmed.

Top management support is identified to have a statistically significant impact on technology adoption. However, the factor loading for the association between top management support and technology adoption is -0.409. This suggests that top management support has a statistically significant negative association with technology adoption intention such that an increase in top management support lowers the internal auditor’s intention to adopt technology. Hence, the hypothesis that “The higher the level of top management support, the higher will be the internal auditor’s intention to adopt CAATs” is rejected. Existing research suggest that the top management support creates a favourable environment for internal auditors to adopt CAATs (Rosli et al. 2012; Seol et al.
2011). Thus, drawing on the literature it was expected that increased top management support would lead to increased intention on the part of the internal auditors to adopt technology, and that decreased top management support would lead to a decreased intention in this regard.

Time pressure is another independent variable which was identified to have a statistically significant association with technology adoption. The standardised loading for time pressure was 0.529. This suggests that time pressure has a statistically significant positive association with technology adoption. This means that the higher the time pressure experienced in gathering evidence, the higher the chances of internal auditors adopting technology. Hence, the hypothesis, “The higher the level of audit time pressure, the higher will be the internal auditor’s intention to use CAATs” can be confirmed. This is consistent with existing research which suggests that when faced with time pressure, technology adoption reduces audit inefficiencies and improves audit service quality (Curtis & Payne 2008; Janvrin et al. 2008; McDaniel 1990).

Effort expectancy is another variable that has a statistically significant impact on technology adoption. The factor loading of effort expectancy and technology adoption was 0.348, which suggests that there is a positive association between effort expectancy and technology adoption. This suggests that an increase in effort expectancy increases the internal auditor’s intention to adopt technology. Thus, the hypothesis that “The lower the level of effort expectancy, the higher the internal auditor’s intention to use CAATs” is confirmed. Existing research suggests that the perception that the CAATs are easy to use increases the internal auditor’s intention of adopting technology (Curtis & Payne 2014; Janvrin et al. 2008). Hence, the findings of this research validates existing research and
confirms that the increase in effort expectancy increases the internal auditors’ intention to adopt technology.

The statistical significance of the independent variables in predicting the internal auditor’s intention to adopt CAATs can be determined by the p-values for each hypothesis tested. The p-values for each hypothesis tested for this research indicate that only four hypotheses for the T-O-E-I Framework were confirmed. P-values between 0.1 and 0.05 are considered to have a weak statistically significant influence on the internal auditor’s intention to adopt technology (Cramer and Howitt 2004), while P-values which are lower than 0.05 are considered to have a statistically significant impact on the internal auditor’s intention to adopt technology (Cramer and Howitt 2004). Thus, the internal auditor’s intention to adopt technology can be predicted using the independent variables of top management support, technology readiness, technology risks, time pressure, and effort expectancy. Although top management support had a statistically significant influence, top management support had a negative association with the dependent variable.

That majority of the variables that were examined for their impact on the internal auditor’s intention to adopt internal audit technology were rejected. In the technological factors examined, technological benefits did not have a statistically significant influence on the internal auditor’s intention to adopt CAATs. The technology benefits that lead to technology adoption depend on the extent to which the users perceive that technology fits the task (Goodhue & Thompson, 1995; Marsh & Flanagan, 2000). The internal auditors in this research may have perceived that CAATs would not fit the specific tasks they are required to perform effectively. This might be a reason why the study did not identify a
statistically significant association between technology benefits and internal auditors’ intention to adopt technology.

The second set of factors in the T-O-E-I Framework represented organisational factors. A total of three hypotheses were tested for organisational factors. The first hypothesis was, “the higher the level of top management support for skill development, the higher will be the internal auditor’s intention to adopt technology”. The second hypothesis was, “the lower the level of top management support, the lower will be the internal auditor’s intention to adopt technology”. The third hypothesis was, “the higher the pressure from management, the lower will be the internal auditor’s intention to adopt technology”. All three hypotheses in relation to organisational factors were rejected. Top management support for skills development was identified to have a statistically significant negative impact on the internal auditor’s intention to adopt technology. This is contrary to the hypothesis. A lack of top management support and pressure from management also had a statistically significant negative influence on the internal auditor’s intention to adopt technology.

The third set of factors in the T-O-E-I Framework are environmental factors. A total of four hypotheses were examined here. The hypothesis that “the higher the time pressure on performance, the higher will be the internal auditor’s intention to adopt technology”, and the hypothesis that “the higher the internal auditor’s independence over budgets and planning, the higher will be the internal auditor’s intention to adopt technology”, were both rejected. The variables namely, (1) time pressure on performance and (2) internal auditor independence in setting budgets and internal audit planning did not have a statistically significant impact on the internal auditor’s intention to adopt technology. In
relation to time pressure, internal auditors bearing a limited understanding of technology require training (Curtis & Payne 2008), so this may be a reason for no significant impact of time pressure on performance on the internal auditor’s intention to adopt technology.

The fourth set of factors in the T-O-E-I Framework is termed individual factors. There were nine hypotheses tested under the five individual factors of technology readiness, performance expectancy, effort expectancy, facilitating conditions and social influence. Of the nine hypotheses tested, only two hypotheses were confirmed. The hypotheses rejected were as follows. (1) The higher the level of insecurity, the lower will be the internal auditor’s intention to adopt CAATs. (2) The higher the level of optimism, the higher will be the internal auditor’s intention to adopt CAATs. (3) The higher the level of discomfort, the lower will be the internal auditor’s intention to adopt CAATs. (4) The higher the expected performance by adopting technology, the higher will be the internal auditor’s intention to adopt CAATs. (5) The higher the level of facilitating conditions within the audit organisation, the higher will be the internal auditor’s intention to adopt CAATs. (6) The higher the level of social influence from the organisation to adopt technology, the higher will be the internal auditor’s intention to adopt CAATs. (7) The higher the level of social influence from personnel to adopt technology, the higher will be the internal auditor’s intention to adopt CAATs.

7.13 Standard Linear Regression for Audit Quality Framework

A linear regression shows how much variation an independent variable can cause in the dependent variable (Park et al. 2003). The dependent variable for the Audit Quality Framework is audit quality. The original intention was only to test to see if adoption intention had a significant effect on audit quality. However, the Audit Quality Framework
examined the influence of six independent variables namely, performance expectancy, time pressure, audit independence, pressure from management, top management support and CAAT adoption intention. Figure 7.4 shows the proposed Audit Quality Framework from this research.

Figure 7.4 Proposed Audit Quality Framework

Source: Author’s Own

The results of the linear regression for the Audit Quality Framework are provided in Table 7.27. The output of the linear regression analysis of the Audit Quality Framework includes the model summary, ANOVA table and coefficients. The model summary for the Audit
Quality Framework has an R and $R^2$ values of 0.617 and 0.381 respectively. The R value suggests that there is a medium degree of correlation, while the $R^2$ value indicates the total variation in audit quality that can be predicted with the independent variables. Only 38% of the variation in audit quality can be predicted with independent variables. The ANOVA results from the linear regression reports the extent to which the independent variables can predict audit quality. The significance value in the ANOVA table is 0.000. As the p-value is less than 0.05, it indicates that the regression model can statistically significantly predict Audit Quality.

The coefficients table allows one to determine how the dependent variable can be predicted with independent variables. The correlation coefficient table obtained from the linear regression is given in Table 7.27. The B value under the unstandardised coefficient is used to present the regression equation for audit quality.

### Table 7.27 Coefficients - Linear Regression

<table>
<thead>
<tr>
<th>Factors</th>
<th>Unstandardised Coefficients</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td></td>
<td>0.141</td>
<td>0.246</td>
<td>0.574</td>
<td>0.566</td>
</tr>
<tr>
<td>Performance Expectancy (PE)</td>
<td></td>
<td>0.121</td>
<td>0.053</td>
<td>2.303</td>
<td>0.022</td>
</tr>
<tr>
<td>Time Pressure Evidence (TP1)</td>
<td></td>
<td>0.126</td>
<td>0.053</td>
<td>2.399</td>
<td>0.017</td>
</tr>
<tr>
<td>Time Pressure Performance (TP2)</td>
<td></td>
<td>-0.008</td>
<td>0.048</td>
<td>-1.74</td>
<td>0.862</td>
</tr>
<tr>
<td>Audit Independence Budget (IND1)</td>
<td></td>
<td>0.073</td>
<td>0.050</td>
<td>1.475</td>
<td>0.141</td>
</tr>
<tr>
<td>Audit Independence Planning (IND2)</td>
<td></td>
<td>0.221</td>
<td>0.048</td>
<td>4.656</td>
<td>0.000</td>
</tr>
<tr>
<td>Pressure for Management (PM)</td>
<td></td>
<td>0.216</td>
<td>0.055</td>
<td>3.906</td>
<td>0.000</td>
</tr>
<tr>
<td>Top Management Support for Skills Development (TMS1)</td>
<td></td>
<td>0.002</td>
<td>0.045</td>
<td>0.039</td>
<td>0.969</td>
</tr>
<tr>
<td>Top Management Support for Meeting Needs (TMS2)</td>
<td></td>
<td>0.202</td>
<td>0.050</td>
<td>4.038</td>
<td>0.000</td>
</tr>
<tr>
<td>CAAT Adoption</td>
<td></td>
<td>-0.161</td>
<td>0.117</td>
<td>-1.379</td>
<td>0.169</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audit Duration</td>
<td></td>
<td>0.011</td>
<td>0.042</td>
<td>0.268</td>
<td>0.789</td>
</tr>
<tr>
<td>Audit Experience</td>
<td></td>
<td>0.059</td>
<td>0.048</td>
<td>1.224</td>
<td>0.222</td>
</tr>
<tr>
<td>Team Size</td>
<td></td>
<td>-0.007</td>
<td>0.051</td>
<td>-1.35</td>
<td>0.893</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>-0.123</td>
<td>0.067</td>
<td>-1.822</td>
<td>0.069</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>-0.009</td>
<td>0.005</td>
<td>-1.881</td>
<td>0.061</td>
</tr>
<tr>
<td>Qualifications</td>
<td></td>
<td>-0.008</td>
<td>0.061</td>
<td>-0.137</td>
<td>0.891</td>
</tr>
</tbody>
</table>

Dependent Variable: Audit Quality

266
The coefficients table from the linear regression allows one to envisage how the dependent variable can be predicted from independent variables. The independent variables namely, performance expectancy, time pressure, audit independence, pressure from management and top management support, were identified to have a statistically significant impact on audit quality. The demographic variables of audit team size, audit duration and audit experience had no statistically significant impact on audit quality. However, the control variables namely, age and gender had a statistically significant impact on audit quality. The results indicate that an increase in age decreases audit quality. Gender was a binary variable, with males representing 1 and females representing 2. Thus, the result suggest that males represent higher audit quality than females. Although there is a statistically significant association between age and gender with audit quality the strength of the association is small. Based on the output of the linear regression, the regression equation for audit quality can be presented as follows:

Audit Quality = .141 + (.121 x performance expectancy) + (.126 x Time pressure evidence) + (.22 x Audit independence planning) + (.22 x Pressure from Management) + (.20 x Top management support in meeting needs) + (-.123 x Age) + (-.009 x Gender). The next paragraphs explains the results of the linear regression to evaluate the hypotheses.

Endogeneity is an important concern when testing hypotheses using cross-sectional data as it can undermine causal interpretation of the results (Wooldridge, 2008). A typical problem that causes endogeneity is that of omitted variable bias (Verbeek, 2008) where a variable that is not included in the model that affects one or more of the independent variables. This thesis included many different variables using the T-O-E-I framework than
prior studies so took some steps in attempting to control for this issue. However topics such as power and culture which emerged from the interviews were not measured in detail in the questionnaire and as such may be missing variables. The Top Management Support variable (Alkebsi, Aziz, Mohammed and Dhaifallah, 2014; Curtis and Payne, 2008), and the Pressure from Management factors (Rosli et al., 2012) likely capture some of these issues but perhaps not all. One method suggested by the literature is to test to see if the residuals from the OLS regression equation correlate with the independent variables (Verbeek, 2008). The model was run in SPSS and the residuals (standardised and unstandardized) were saved. Correlations between the independent variables and the residuals were 0 thus indicating that endogeneity is not perhaps not a significant issue.

Table 7.28 shows the hypotheses, structural path, unstandardised coefficients, t-value and p-value for the Audit Quality Framework. Performance expectancy is a variable that had a statistically significant impact on audit quality. The standardised coefficient Beta of performance expectancy was 0.121, which suggests that performance expectancy has a positive association with audit quality. This means that the higher the internal auditor’s performance expectancy with technology adoption, the higher will be the internal auditor’s perception of audit quality. Hence, the hypothesis that “The higher the level of performance expectancy, the greater the level of audit quality perceived by internal auditors” can be confirmed.

Time pressure is another independent variable identified to have a statistically significant impact on audit quality. Per Table 7.27, the standardised coefficients Beta of time pressure at 0.126 suggests that time pressure has a positive association with audit quality. This means that the higher the time pressure, the higher the level of audit quality. Hence the
hypotheses that “The lower the level of time pressure, the higher the level of audit quality perceived by internal auditors” cannot be confirmed.

Audit independence planning is another independent variable that is identified to have a statistically significant impact on audit quality. As per Table 7.27, the standardised coefficient Beta for audit independence planning was 0.221. This means that audit independence planning has a positive association with audit quality. Accordingly, the higher the level of audit independence planning, the higher will be the level of audit quality perceived by internal auditors. Hence, the statement that “Technology adoption from a more independent management can increase audit quality” can be confirmed.

Pressure from management is a further independent variable identified to have a statistically significant impact on audit quality. The standardised coefficient Beta for pressure from management at 0.216 suggests that pressure from management had a statistically significant positive impact on audit quality. The means the higher the pressure from management, the higher the level of audit quality perceived by internal auditors. Hence, the hypothesis that “The lower the level of pressure from top management, the higher the level audit quality perceived by internal auditors” cannot be confirmed.

Top management support is another independent variable identified to have a statistically significant impact on audit quality. The standardised coefficient Beta for top management support was 0.202, which suggests that there is a positive association between top management support and audit quality. This means that an increase in top management support leads to increased audit quality. Accordingly, the hypothesis that “The higher the
level of top management support, the higher the level of audit quality perceived by internal auditors” can be confirmed.

Table 7.28 Linear Regression for Audit Quality Framework

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Path</th>
<th>Standardized Coefficients Beta</th>
<th>t-value</th>
<th>p-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H12</td>
<td>Performance expectancy – audit quality</td>
<td>0.121</td>
<td>2.303</td>
<td>.022</td>
<td>Supported</td>
</tr>
<tr>
<td>H13a</td>
<td>Time pressure evidence – audit quality</td>
<td>0.126</td>
<td>2.399</td>
<td>.017</td>
<td>Not supported</td>
</tr>
<tr>
<td>H13b</td>
<td>Time pressure performance – audit quality</td>
<td>-0.008</td>
<td>-0.174</td>
<td>.862</td>
<td>Not supported</td>
</tr>
<tr>
<td>H14a</td>
<td>Audit independence budgets – audit quality</td>
<td>0.073</td>
<td>1.475</td>
<td>.141</td>
<td>Not supported</td>
</tr>
<tr>
<td>H14b</td>
<td>Audit independence planning – audit quality</td>
<td>0.221</td>
<td>4.656</td>
<td>.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H15</td>
<td>Pressure from management – audit quality</td>
<td>0.216</td>
<td>3.906</td>
<td>.000</td>
<td>Not supported</td>
</tr>
<tr>
<td>H16a</td>
<td>Top management support for skills development – audit quality</td>
<td>0.002</td>
<td>0.039</td>
<td>0.969</td>
<td>Not supported</td>
</tr>
<tr>
<td>H16b</td>
<td>Top management support for meeting needs – audit quality</td>
<td>0.202</td>
<td>4.038</td>
<td>.000</td>
<td>Supported</td>
</tr>
<tr>
<td>H17</td>
<td>Adoption intention – audit quality</td>
<td>-0.161</td>
<td>-1.379</td>
<td>0.169</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

The purpose of the linear regression analysis conducted on the Audit Quality Framework was to predict the dependent variable for audit quality. The p-value of the independent
variables for the Audit Quality Framework indicate that five hypotheses can significantly predict audit quality. H12, H14b and H16b were identified to statistically significantly predict audit quality. Thus, the Audit Quality Framework was found to significantly predict the impact of five independent variables namely, performance expectancy, time pressure evidence, audit independence planning, pressure from management, and lack of top management support on audit quality.

7.14 Conclusion

This chapter presented the results of the factor analysis and regression analysis used to develop the T-O-E-I Framework and Audit Quality Framework respectively. The use of principal component analysis for reducing the variables for the T-O-E-I Framework was justified. This was followed by a discussion of the use of varimax rotation to identify the best fitting model. The results of the principal component analysis and varimax rotation were provided. Any item within the factors identified with communalities of lower than 0.4 were removed. The regression analysis for testing the Audit Quality Framework was then discussed. This chapter explained the different types of regression and their application in this research. The findings of the regression analysis were documented. Based on the findings from the principal component analysis with varimax rotation, new hypotheses were developed for the T-O-E-I Framework and Audit Quality Framework respectively. Chapter Eight presents the conclusions from this research including its theoretical implications and practical contributions.
8. Conclusion

8.1 Introduction

The benefits of technology based auditing such as the use of computer assisted audit techniques (CAATs) are increasingly recognised by internal auditors in achieving internal audit objectives in an efficient manner (Smidt et al. 2014). For example, technology based auditing may permit 100% of an organisation’s transactions to be examined (Coderre 2009), rather than relying on traditional sampling based procedures. Despite the vast potential of technology assisted internal auditing, studies show that the CAATs are not utilised to their full potential for internal audit purposes (Chan & Vasarhelyi 2011; Gonzalez, Sharma, & Galletta 2012). According to the Irish Institute of Internal Auditors (IIA 2003), the main reasons for low adoption of CAATs by internal auditors include a lack of suitable technology, technology risks such as fraud, and a lack of adequate skills to proficiently complete audit tasks. While CAAT adoption is a decision undertaken at the organisation level, adoption by individual internal auditors brings different perspectives. For instance, individuals can hamper organisational adoption. Accordingly, a focus on the individual is important in understanding CAAT adoption, as while an organisation can mandate the use of CAATs, this does not mean that all features will be properly adopted by the individual internal auditors, as they may not wish to materially change their work practices.

This thesis focuses on a group of individuals working in internal audit in three state-level organisations in the Sultanate of Oman. The Sultanate has three main organisations that are set up to organise internal auditing across the apparatus of the state: the State Audit Institution (SAI), and the audit functions of the Royal Court Affairs (RCA) and the Royal Army of Oman (RAO). These three organisations provide internal audits for government.
The Sultanate of Oman is an oil-rich country that is modernising at a rapid rate. Part of this modernisation is bringing in better ways of working including in internal audit. Education of staff in new technologies is a feature of these organisations but as yet there has not been a large scale installation of CAATs across the public sector in Oman. As a result, this research considers the situation of pre-implementation of CAATs however the individual auditors are aware of CAATs and their potential benefits. As such this is an interesting time to investigate this area. While CAAT implementation is likely to occur over the next few years, the attitudes and perceptions of individual auditors are going to play a key role in the success of such initiatives. This shows the importance of research focussing on internal auditors and their perceptions of CAATs.

Vasarhelyi, Alles, & Williams (2010) maintain that the degree of choice associated with the adoption of information technology for internal auditing is a key reason for the limited or slow pace of its implementation. When technology adoption in the internal auditing area is voluntary, understanding the factors influencing the internal auditor’s intention to adopt that technology is crucial, as it enables organisations to develop strategies capable of promoting technology adoption. The T-O-E-I Framework developed in this study predicts the internal auditor’s intention to adopt CAATs. The technological factors in this model are the technological benefits and risks perceived by internal auditors in respect of CAAT adoption. The organisational factors focus on the internal auditor’s perception of top management support and pressure from management to the extent that they impact CAAT adoption. The environmental factors measure the internal auditor’s perception of time pressure and audit independence, and how they influence the auditor’s intention to adopt CAATs. Finally, the individual factors measure the influence of technology readiness, effort expectancy, performance expectancy, facilitating conditions and social influence on
the internal auditor’s intention to adopt CAATs. An evaluation of the internal auditor’s perception of these four universal factors identifies the main causes underlying their intention to adopt or not adopt CAATs.

Adoption of CAATs is perceived to have a positive impact on the quality of the internal audit process (Omonuk & Oni 2015). Accordingly, the second theoretical model developed in this study is the Audit Quality Framework. The purpose of the development of this model is to evaluate factors that have a direct impact on perceptions of audit quality. The ability of CAATs to deliver a more accurate and thorough internal audit solution highlights their potential positive impact on audit quality (Vasarhelyi & Romero, 2014). However, Omonuk and Oni (2015) found that not all organisations that adopt CAATs achieve high audit quality. Thus, there is a need for an Audit Quality Framework capable of explaining the factors, outside of CAATs, that play a key role in driving audit quality. This research finds that performance expectancy, time pressure, auditor independence and top management support are the components of the Audit Quality Framework that have a positive influence on audit quality. The Audit Quality Framework developed in this study is based on the belief that adoption of CAATs alone, is insufficient to achieve high internal audit quality, in line with Omonuk and Oni (2015). Our result supports their finding which is against the general theme of the literature in the area.

This study is opportune for two main reasons. Firstly, the adoption of information technology for internal auditing is gradually gaining purchase, and many public and private organisations in both developing and developed nations are not effectively adopting information technology for internal auditing (Smidt, van der Nest & Lubbe, 2014). Furthermore, many organisations that have adopted information technology have
implemented it only in limited areas of internal auditing, such as in evidence gathering and in tests of controls (Smidt et al. 2014). Other areas such as substantive testing, data analytics and continuous monitoring would benefit greatly from the use of technology (Janvrin, Lowe & Bierstaker 2008; Smidt et al. 2014).

Secondly, adoption of information technology in internal auditing is mainly measured via existing technology adoption models such as the UTAUT, the TRA and the TAM (Moorthy, Seetharaman, Mohamed, Gopalan, & San 2011; Vasarhelyi et al. 2012; Williams, Rana & Dwivedi 2015). However, these models fail to consider factors that are specific to the internal audit context such as audit independence and audit time pressure (Janvrin et al. 2008; Moorthy et al. 2011). Accordingly, this study addresses a major gap in the literature by providing a theoretical framework for technology adoption specific to the internal audit context. Curtis et al., (2008) acknowledged a gap in existing research in relation to explaining the voluntary usage of CAATs by internal auditors. In the absence of a theoretical framework to measure the technology adoption intention in an audit context, Curtis and Payne (2014) used an extended framework based on the TAM, to identify technology reluctance in an internal audit context. With increasing volumes of data, and increasing expectations of internal auditors, it is becoming more necessary to embrace technology for internal audit purposes (Smidt et al. 2014). Overcoming the barriers to the voluntary adoption of CAATs for internal auditing will increase technology adoption by internal auditors and potentially increase its efficiency and effectiveness. The T-O-E-I Framework developed in this research provides four main factors that influence the internal auditor’s intention to adopt CAATs. The underlying factors that influence the intention to adopt CAATs may vary for each individual auditor. For example, a study conducted by Shamsuddin et al., (2015) found that the key factors influencing the intention
to adopt CAATs by internal auditors in Malaysia was perceived ease of use and effort expectancy.

8.2 Theoretical Contribution

The main theoretical contributions of this research are the development of the T-O-E-I Framework and the Audit Quality Framework. The aim of this study was to develop a conceptual framework for predicting technology adoption intention and audit quality in an internal audit context. The theoretical contribution is divided into two parts. The first part explains the development and testing of the T-O-E-I Framework, and the second part explains the development and testing of the Audit Quality Framework.

8.2.1 Development of T-O-E-I Conceptual Framework

Existing models used by researchers to measure technology adoption by internal auditors such as the UTAUT and the TAM (Mahzan & Lymer 2014), fail to consider factors specific to the internal audit context, and therefore do not provide a comprehensive picture of the factors underlying the technology adoption intention of internal auditors. Following an extensive review of the literature and an evaluation of existing technology acceptance models including the TAM, the TRA, the TOE and the UTAUT (Moorthy et al. 2011; Vasarhelyi et al. 2012; Williams et al. 2015), as well as empirical research conducted on technology adoption (Ahmi, Saidin, Abdullah, Ahmad, & Ismail 2016; Bierstaker, Janvrin, & Lowe 2014; Rosli, Yeow, & Siew 2012; Shamsuddin et al. 2015), the main factors that were found to influence technology adoption intention were used in this research to develop a new conceptual framework specific to the internal auditing context. This new framework developed in this study consists of four main factors namely, technological,
organisational, environmental and individual (T-O-E-I) factors. All four aspects were empirically tested to evaluate their influence on the internal auditor's intention to adopt information technology for internal auditing in the three public audit organisations in Oman.

A two phase methodology allowed the identification of the factors that have a significant influence on the technology adoption intention of internal auditors. The model which was developed initially through a review of the literature and primary qualitative investigation of internal auditors of the three public audit organisations in Oman namely the SAI, the RAO, and the RCA, was empirically tested through a quantitative survey and analysed to validate the T-O-E-I conceptual framework. The T-O-E-I Framework was analysed using binary logistic regression analysis. The dependent variable for the binary logistic regression was technology adoption intention, and the independent variables were (1), technological factors namely, technological benefits and technological risks; (2), organisational factors namely, top management support for skills development, top management support for meeting needs, and pressure from management; (3), environmental factors namely, time pressure on evidence, time pressure on performance, audit independence on budgets, and audit independence on planning; and finally, (4), individual factors namely, technology readiness innovativeness, technology readiness optimism, technology readiness insecurity, technology readiness discomfort, performance expectancy, social influence and effort expectancy.

The logistic regression analysis identified four independent factors namely technological risks (Significance = 0.066), time pressure on evidence (Significance = 0.014), technology readiness on innovativeness (Significance = 0.008) and effort expectancy (Significance =
0.092) to have a statistically significant influence on the technology adoption intention of internal auditors. Accordingly, not all hypotheses were confirmed. However, the general thrust of the T-O-E-I was validated in that each of the four elements were represented in the final model. This has important implications for technology adoption studies. It shows that the use of TAM, TRA, TOE and UTAUT are insufficient on their own to explain adoption decisions. While control variables of various types have been included in the four frameworks to try to account for contextual issues, like Internal Audit in this study, this is insufficient and not useful for future researchers. This thesis has comprehensively shown that a model for technology adoption, at least in an organizational context, needs to test the four elements of the T-O-E-I model. Without this there is a danger that key elements will be left out. The TAM and TRA were originally conceptualised as dealing with how individuals adopt technology (King & He, 2006) but they do not specifically consider an organizational context such as internal auditing. This is one of the strengths of the proposed T-O-E-I approach and a key contribution of the work.

Top management support for skills development was identified to have a statistically significant negative influence on the internal auditor’s intention to adopt technology. However, the hypothesis was that the increase in top management support would result in an increase in the internal auditors’ intention to adopt technology. This is an interesting finding as it challenges accepted wisdom that top management support has a positive influence on IT adoption. This may be due to a negative perception of the intentions of management with respect to technology adoption. This result may be down to the institutional context of this research, as in an economy such as Oman where full employment is a national goal, the use of technology may not be a priority, especially when the literature emphasises the increased efficiency it yields. Changes in technology can also
instigate new work practices and while the qualitative results presented earlier in this thesis suggest that technology would be welcome given that the environment is heavily paper-based, this is worthy of additional investigation in a regulated context. The discussions with auditors about the culture of the organisations they work in and the high level of management control coupled with a national emphasis on high employment may be problematic in realising the benefits of CAATs.

8.2.2 Development of the Audit Quality Framework

The second theoretical contribution of this research is the development of the Audit Quality Framework. Although some previous studies indicate that information technology adoption may increase audit quality (Kim, Mannino, & Nieschwietz 2009), other studies that have found that CAAT adoption alone does not necessarily contribute towards increased audit quality (Shamsuddin et al. 2015). However, despite the research that CAAT adoption may not necessarily lead to improved audit quality, there is no little research on the factors that may impact audit quality. This study addresses that gap by developing a theoretical framework which focuses on different elements that drive the perceptions by internal auditors of audit quality. A classical element of this is of course CAATs but there are other organisational factors that are also important and this conceptualisation concentrates on these.

The second theoretical framework developed in this research namely, the Audit Quality Framework consists of six factors that contribute towards better audit quality. The variables included in the model are performance expectancy, top management support, audit independence, audit time pressure, pressure from management and technology
adoption intention. The variables for the Audit Quality Framework were identified based on an evaluation of previous studies which examined audit quality (Griffith, Hammersley, & Kadous 2015; Svanberg & Öhman 2013). Standard OLS linear regression was used to analyse the Audit Quality Framework. The dependent variable for the Audit Quality Framework is audit quality, and the independent variables are performance expectancy, time pressure evidence, time pressure performance, audit independence budget, audit independence planning, and pressure for management, top management support for skills development and top management support for meeting needs. During the analysis phase some of these variables were found to have multiple factors. Five independent variables were identified to have a statistically significant impact on audit quality with technology adoption. These are performance expectancy, time pressure evidence, audit independence planning, pressure from management and top management support for meeting needs. The time pressure for evidence gathering was hypothesised to have a negative impact on audit quality. However, the result of the linear regression suggests that time pressure for evidence gathering has a positive impact on audit quality. The impact of pressure from management on audit quality is another hypothesis that was not confirmed. The hypothesis stated that higher pressure from management leads to lower audit quality. However, the results indicated that higher pressure from management leads to higher audit quality, which is contrary to the core literature. This may be due to cultural issues where in an environment that is not highly pressurised audit quality is not seen in the same way. The next section explains the development of the validated instruments for the T-O-E-I Framework and the Audit Quality Framework.
8.2.3 Development of Validated Instruments

A new validated instrument to measure technology adoption intention in an internal audit context was developed in this empirical study. Specific constructs for technological, organisational, environmental and individual factors were developed in the T-O-E-I Framework, with valid and reliable items to measure all of these constructs. All the items developed to measure the four constructs were validated, thereby increasing the reliability and accuracy of the instrument for measuring the technology adoption intention of internal auditors.

A validated instrument for the Audit Quality Framework was also developed in this study, with items to measure the six underlying factors of technology adoption that influence audit quality namely, performance expectancy, top management support, audit independence, audit time pressure, pressure from management and technology adoption intention. All the items used to measure the six factors of the Audit Quality Framework were empirically examined and tested for reliability and validity. This instrument clarifies the factors mediating the relationship between CAAT adoption intention and audit quality. An interesting empirical contribution of this work is the finding that the time pressure construct which was previously validated by Azad (1994) and supported by Bowrin and King (2010), split into two sub-constructs. This may be due to the fact that in a country such as Oman, time pressure is not a significant factor given the national policy of trying to maintain full employment. This research found two types of time pressure on internal auditors namely, pressure relating to gathering audit evidence and pressure relating to performance evaluation of internal auditors. This finding will aid other researchers in disentangling the relationship between time pressure and other constructs in an internal, and potentially external audit context.
8.2.4 Predicting Intention to Adopt Technology

The T-O-E-I Framework is appropriate to identify the main reasons for reluctance to adopt information technology for internal auditing. Although there is evidence to suggest a reluctance among internal auditors to adopt CAATs for internal auditing, few studies examine the factors hindering the internal auditor’s intention to adopt new technologies (Curtis & Payne 2014). Specifically identifying the main factors that prevent internal auditors from adopting CAATs can support the development of strategies to facilitate CAAT adoption going forward.

8.2.5 Influence of Technological Factors

The influence of technological factors namely, technological risks and technological benefits on the internal auditor’s intention to adopt CAATs for internal auditing is developed in this study. The items used to measure technological risks and technological benefits in the T-O-E-I Framework can predict the technology adoption intention of internal auditors. This enables organisations to adopt strategies to overcome the technological risks and enhance the technological benefits perceived by internal auditors, thereby increasing the internal auditor’s intention to adopt CAATs. Thus, identification of the technological risks and technological benefits having a significant influence on the internal auditor’s intention to adopt information technology for internal auditing is another theoretical contribution of this study. Although some studies have identified the role of technological risks (Lam, Chiang, & Parasuraman 2008; Rosli et al. 2012) and technological benefits (Braun & Davis 2003; Moorthy et al. 2011; Weidenmier & Ramamoorti 2006) on the auditor’s intention to adopt technology, no previous attempts
have been made to specifically identify the technological risks and technological benefits that have a significant influence on the internal auditor's intention to adopt technology.

The results of this study indicate that only technological risks have a statistically significant negative impact on the technology adoption intention of internal auditors. An increase in the internal auditor’s perception of technological risks significantly reduces the internal auditor’s intention to adopt technology. Risk aversion is one of the main reasons for internal auditors being reluctant to adopt technology. Furthermore, technology risks are likely to result in decreased internal audit effectiveness and productivity which increases reluctance to adopt internal audit technology (Rosli et al. 2012). When technology is expected to adversely affect the quality of the internal audit, this may result in decreased intention to adopt internal audit technology. The hypothesis that technology benefits have a positive impact on the internal auditor’s intention to adopt technology was rejected. Accordingly, the perception of technology benefits from adopting internal audit technology is not identified to significantly influence the internal auditor’s intention to adopt technology for internal auditing.

8.2.6 Influence of Organisational Factors

The influence of organisational factors on the internal auditor’s intention to adopt technology namely, top management support and pressure from management is developed in this study. Although some studies have examined the role of top management support (Alkebsi, Aziz, Mohammed, & Dhaifallah 2014), technology readiness (Rosli et al. 2012; Venkatesh, Morris, Davis, & Davis 2003) and pressure from management (Bierstaker et al. 2014), no studies to date provide the items that measure the specific components of top
management support and pressure from management which influence the internal auditor’s intention to adopt CAATs for internal auditing. Thus, the identification of the specific items to measure the constructs of top management support and pressure from management is a further theoretical contribution of this study.

Top management support was measured using two hypotheses, which state that positive top management support leads to technology adoption, and a lack of top management support leads to decreased intention on the part of internal auditors to adopt technology. The third hypothesis measured in relation to organisational support, is that pressure from management results in technology adoption. In this study none of the hypotheses in relation to organisational support were confirmed. This study found that top management support has a statistically significant influence on the internal auditor’s intention to adopt audit technology. This means the higher the level of top management support, the lower will be the internal auditor’s intention to adopt internal audit technology.

8.2.7 Influence of Environmental Factors

The influence of environmental factors namely, time pressure and audit independence on the internal auditor’s intention to adopt technology is developed in this study. Existing technology adoption models such as the TAM, the TRA and the UTAUT focused mainly on the influence of technological, organisational or individual factors in evaluating an individual’s intention to adopt technology (Venkatesh et al. 2003, Samaradiwakara and Gunawardena 2014; Williams et al. 2015). However, there are no technology adoption models that evaluate the influence of environmental factors on the internal auditor’s intention to adopt technology. Based on an extensive review of the literature on the factors influencing the internal auditor’s intention to adopt technology, the audit time pressure and
audit independence constructs were identified as factors that influence the internal auditor’s intention to adopt technology (Hodge, Subramaniam, & Stewart 2009; Khodamoradi & Hajiha 2016; Sun 2012). Thus, another theoretical contribution to emerge from this study is the incorporation of specific internal audit environmental factors namely, audit independence and audit time pressure in the T-O-E-I Framework to measure the internal auditor’s intention to adopt technology. Furthermore, currently there is no empirically tested instrument to measure independence and time pressure for internal auditors. Accordingly, the measures in this instrument address this gap in the literature.

There were four hypotheses in relation to the environmental factors of time pressure and audit independence. Time pressure was identified as the only variable to have a statistically significant impact on technology adoption intention. The only hypothesis confirmed was, the higher the level of time pressure on audit evidence gathering, the higher will be the internal auditor’s intention to adopt CAATs. This is because technology adoption is acknowledged to enhance audit quality in a time constrained internal audit environment (Curtis and Payne 2014). The main advantage of CAATs is the completion of internal audit tasks within the time limits set (Janvrin et al. 2008). Accordingly, one reason why time pressure increases the internal auditor’s intention to adopt technology could be because it allows internal auditors to complete internal audit tasks within the time limits set, with satisfactory audit quality.

8.2.8 Influence of Individual Factors

Finally, the individual factors namely, technology readiness, effort expectancy, performance expectancy, social influence and facilitating conditions were identified to
have a significant influence on the internal auditor’s intention to adopt CAATs. Several technology adoption models have examined the influence of individual factors such as effort expectancy, performance expectancy, social influence, and facilitating conditions on the technology adoption intention of an individual (Venkatesh et al. 2003; Curtis & Payne 2014). Individual level factors are acknowledged to have a significant influence on the internal auditor’s intention to adopt technology (Davis, Bagozzi, & Warshaw 1989; Gonzalez et al. 2012; Razi & Madani 2013; Vasarhelyi et al. 2012). The theoretical contribution of the T-O-E-I Framework is that it specifically identified the items for the individual factors construct that are relevant to an internal audit context.

The individual factors that were identified to have a statistically significant impact on the internal auditor’s intention to adopt technology are technology readiness and effort expectancy. The impact of technology readiness on the internal auditor’s intention to adopt technology was measured using four hypotheses namely, the impact of innovativeness, optimism, discomfort and insecurity. Additionally, technology readiness innovativeness has a statistically significant positive impact on the internal auditor's intention to adopt technology. This research found that effort expectancy has a positive impact on the internal auditor’s intention to adopt technology for internal auditing. This means that the higher the internal auditor’s perception that audit technology is easy to use, the higher will be the internal auditor’s intention to adopt technology (Janvrin et al. 2008).

8.3 Limitations of Study and Future Research Directions
The findings of this study should be evaluated in light of a number of limitations. The TO-E-I Framework is developed in the internal audit context of the three public audit organisations in Oman. Accordingly, the social and cultural background of Oman may
have a significant influence on the attitude of the internal auditors towards the different constructs in the T-O-E-I Framework. To address this limitation, future research on the intention to adopt information technology for internal auditing could be undertaken in other countries having cultural dimensions that differ to Oman. This will help to determine the applicability and validity of the T-O-E-I Framework for other cultural contexts.

Another potential shortcoming of the T-O-E-I Framework pertains to the length of the instrument for measuring technology adoption intention. The T-O-E-I Framework consists of four high level factors and a total of 11 constructs for these factors. According, the length of the instrument to measure the technology adoption intention of internal auditors could be perceived as somewhat onerous. The Audit Quality Framework also has certain limitations. For instance, the factors selected to predict audit quality with the adoption of CAATs originated from the T-O-E-I Framework. This may have resulted in some variables not being considered which were not measured as part of the T-O-E-I framework. Potential examples include organisational culture variables and national culture variables. Involvement in the decision to adopt can be a powerful motivator for individuals. In a high power distance culture coupled with a bureaucratic organisation, prevalent in the context of government audit institutions in Oman, individuals may not have much involvement. However senior individuals, a very small part of the sample, may have higher levels of power and as such may have an interest in this issue.

8.4 Managerial Implications

In the modern competitive business environment, the adoption of technology based internal auditing has become increasingly necessary as it allows actual business transactions to be
processed on a real-time basis, and has the capacity to provide ongoing timely assurance (Vasarhelyi et al. 2012). The T-O-E-I Framework developed in this study can offer first-hand insights to management of organisations on the factors influencing the internal auditor’s intention to adopt technology for auditing. Application of the T-OE-I Framework in the internal audit context can provide managers with a real understanding of the factors that impacting the internal auditor’s intention to adopt information technology, thus enabling them to devise practical strategies to overcome the factors hindering technology adoption. There continues to be substantial reluctance among auditors surrounding the use of CAATs for auditing purposes (Curtis and Payne, 2014). The T-O-E-I Framework when used to evaluate the perception of internal auditors, can produce valuable insights into the underlying causes of their reluctance, and facilitate the development of appropriate strategies to address them.

A key reason for adopting technology for internal auditing is to increase audit quality. Organisations can evaluate the scores of the six factors of the Audit Quality Framework to identify areas for improvement in delivering increased audit quality. For example, as per the Audit Quality Framework, when there is increased pressure on internal auditors from management, this adversely affects audit quality. Accordingly, organisations can devise and implement strategies to lessen pressure felt from management, thereby improving audit quality.

Based on the factors that were identified to have a statistically significant impact on the internal auditor’s intention to adopt technology, management should implement specific strategies to increase the internal auditor’s intention to adopt technology. To increase the internal auditors intention to adopt technology, managers need to increase top management
support, address the internal auditor’s concerns regarding technological risks, provide adequate support to increase technological readiness by enhancing the innovativeness of internal auditors and providing support such as training in order to make technology based auditing easy to use.


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Appendices
Appendix I – Interview Participant Information Sheet

Participant Information Sheet for Qualitative Interviews

Title of Research Study:
“Developing and assessing the drivers of usage of computer-assisted audit techniques (CAATs) in government internal audit”

Dear Participant,

You are invited to participate in a research study the aim of which is explore the factors influencing the adoption of computer assisted audit techniques (CAATs) in public organisations in Oman. I would like to interview you to explore your experiences with CAATs in the context of internal audit. This research is part of a PhD dissertation at the Dublin Institute of Technology (DIT), Ireland.

Before you decide whether to partake in the study it is important that you understand what the research is for, and what you will be asked to do. Please take time to read the following information and discuss it with others if you wish. It is up to you to decide whether or not to take part. If you decide to take part you will be given this information sheet to keep.

The interviews will be carried out on a one-to-one, face-to-face basis and will last for up to one hour. All participants have a choice on whether to partake in the research, decline the invitation, and/or withdraw from the interview once started. In addition, participants have the option of where to hold the interview, although it is anticipated that the majority of respondents will opt for their workplace. It is not expected that participants will endure discomfort or stress during the interview, but if you feel uncomfortable about talking about a particular issue, the discussion about that topic will cease.

The interviews will be recorded using a Dictaphone where permitted by the interviewees, and then transcribed onto a computer. Otherwise handwritten notes will be taken. The Dictaphone and notes will be stored in a locked secure place at all times and the computer data will be encrypted. The recordings and notes will be destroyed at the end of the study. Your response will be treated with full confidentiality and anyone who takes part in the
research will be identified only by pseudonyms. You can request a copy of the interview transcript if you wish. The interviews will be analysed by myself, Ashraf Rashid Al-habsi. At the end of the research I will write a report and the results may be published in peer reviewed journals and conference presentations. No research participant will be identifiable from any publications. This study has been reviewed and approved by the Research Ethics Committee at Dublin Institute of Technology.

To ensure that the interviews are appropriately conducted, each participant will be asked to complete the DIT’s consent form prior to their interview. Additionally, participants will have a choice about how their quotations are attributed in the analysis. They will also have the opportunity, if they so choose, to review the transcript of the interview, and check what information, if any, from the interview, will be used in my dissertation, and amend it, if required.

The information gained from this research will be used to make recommendations for best practice and will offer insights into the experiences of usage of CAATs in government internal audit. The results of the study may also lead to further studies into the adoption of other technologies which have increased the efficiency of the public sector in western economics.

We realise that your time and experience are valuable and we greatly appreciate your participation. Should you have any queries, or require further information, please contact the project manager, Ashraf Rashid Al-habsi at: shrafrashid.alhabsi@mydit.ie.

Many thanks for your time and consideration.

Yours sincerely,

____________________________
Ashraf Rashid Al-habsi
Appendix II – Interview Guide

1. What is your opinion of IT in society in general?
2. What do you think about the use of IT for internal auditing purposes?
3. What is the position of your top management in relation to the adoption of IT for internal audit?
4. How easy was it for you to adopt IT for internal auditing?
5. What are the barriers that make the adoption of IT for internal auditing difficult to achieve?
6. What factors in your organisation make the adoption of IT for internal auditing easier?
7. To what extent is IT usage in the internal audit process compatible with the accounting operations / systems in your government organisation?
8. What are the risks associated with using IT for internal audit?
9. Can you describe the IT infrastructure and IT training support for employees in your organisation?
10. What support does top management provide to employees to adopt IT for internal auditing?
11. What measures does management use to encourage you to adopt IT for internal auditing?
12. How important is IT in your organisation to complete an audit within a given timeframe?
13. How does using IT for internal auditing affect auditor independence?
Appendix III – Consent Form

| Researcher’s Name: | (use block capitals) Ashraf Rashid Mansoor Alhabsi | Title: | Mr. |
| Faculty/School/Department: | School of Accounting and Finance | |
| Title of Study: | Developing and assessing the drivers of usage of computer-assisted audit techniques (CAATs) in government internal audit | |

**To be completed by the:**
subject/patient/volunteer/informant/interviewee/parent/guardian *(delete as necessary)*

3.1 Have you been fully informed/read the information sheet about this study? YES/NO

3.2 Have you had an opportunity to ask questions and discuss this study? YES/NO

3.3 Have you received satisfactory answers to all your questions? YES/NO

3.4 Have you received enough information about this study and any associated health and safety implications if applicable? YES/NO

3.5 Do you understand that you are free to withdraw from this study?
- at any time
- without giving a reason for withdrawing
- without affecting your future relationship with the Institute YES/NO

3.6 Do you agree to take part in this study the results of which are likely to be published? YES/NO

3.7 Have you been informed that this consent form shall be kept in the confidence of the researcher? YES/NO

Signed_____________________________________ Date __________________

Name in Block Letters __________________________________________________________

Signature of Researcher ________________________________ Date __________________

Please note:
For persons under 18 years of age the consent of the parents or guardians must be obtained or an explanation given to the Research Ethics Committee and the assent of the child/young person should be obtained to the degree possible dependent on the age of the child/young person. Please complete the Consent Form *(section 4)* for Research Involving ‘Less Powerful’ Subjects or Those under 18 Yrs.
• In some studies, witnessed consent may be appropriate.

• The researcher concerned must sign the consent form after having explained the project to the subject and after having answered his/her questions about the project.
Appendix IV – Survey Instrument (English Version)

Please note that the survey is reproduced here in English. The survey was translated into Arabic for the purposes of dissemination. Due to requirements around thesis binding, some sections have been moved in this version of the instrument so that all scales are clear.
SURVEY

Developing and assessing the drivers of usage of computer-assisted audit techniques (CAATs) in government internal audit in the Sultanate of Oman

As explained in the information letter, the information gained from this survey will be used to make recommendations for best practice and will offer useful insights into the experiences of usage of CAATs in government internal audit.

ALL information provided by you is STRICTLY CONFIDENTIAL
What is your job title?

Auditor assistant □ □ Auditor □ □ First auditor □ □
Team leader □ □ Audit manager □ □ Other □ □
If other, please specify ____________________________

What age group do you belong to?

22-24 □ □ 25-34 □ □ 35-44 □ □ 45-54 □ □ 55 or over □ □

Gender □ □ Male □ □ Female □ □

Highest academic qualification?
None □ □ Diploma □ □ Degree □ □ Masters □ □

Main area of highest academic qualification (e.g. accountancy / finance / law)
____________________________

Professional qualification? _____________________
Please specify _______________________________
**Computer Assisted Audit Techniques (CAATs) Information**

CAATs involve the use of computers for audit work. CAATs refer to the audit technology used by internal and external auditors for auditing information systems in organisations. CAATs are a useful audit tool owing to the increased accountability and auditor workload in the current competitive environment. CAATs enable the filtering of large volumes of data. CAATs are also very effective when working with complex data, and in the identification of non-compliance, and data entry or processing errors.
Please answer the following questions to indicate the level of adoption of CAATs in your current internal auditing activities (Please tick all that apply).

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
I intend to use CAATs in the next year if they become available in my organisation
I predict that I would use CAATs in the next year if they became available in my organisation
I plan to use CAATs in the next year if they become available in my organisation

Quality of Audit Work Please indicate the extent to which you agree or disagree with the following: (please circle only ONE number per line)

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
</table>
1 The annual audit plan is determined completely by the Audit Director
2 The areas audited are very significant to the organisation
3 Internal auditors are able to cover all organisational units and all issues
4 The response of audited organisations to the audit is submitted in writing to the head of audit, and is relevant and comprehensive
5 The internal auditor also performs other activities such as developing procedures, and conducting economic and financial audits
6 There is regular follow-up by the audit manager to examine actions taken to correct problems identified
## SECTION TWO: Influence of Organisational Factors

### Top Management Support
Please indicate the extent to which you agree or disagree with the following: (please circle only **ONE number** per line)

<table>
<thead>
<tr>
<th></th>
<th>Statements</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My organisation identifies employee needs for recognition, work satisfaction, competence and personal development</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Top management ensures that the competence of auditors in my organisation is adequate for developing the skills required for computer assisted auditing</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Top management plan, provide, control and monitor the financial resources necessary to maintain an effective and efficient audit system, and ensure the achievement of the objectives of the organisation</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Top management in my organisation plans to implement new technology for internal auditing</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Top management in my organisation does not provide me with the support I expect to have</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Top management in my organisation is not sufficiently aware of the needs of internal auditors, as demonstrated by the small budget assigned to my department</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Top management in my organisation does not provide enough support and encouragement for training and developing the internal auditors</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

### Pressure from Management
Please indicate the extent to which you agree or disagree with the following: (please circle only **ONE number** per line)

<table>
<thead>
<tr>
<th></th>
<th>Statements</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top management in my organisation represent high audit standards</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Top management in my organisation regularly show that they care about audit work</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Internal auditors in my organisation are expected to do as they are told</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The boss is always right in my organisation</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ethical behavior is the norm in my organisation</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td><strong>Technological Readiness</strong> Please indicate the extent to which you agree or disagree with the following: (please circle only <strong>ONE number</strong> per line)</td>
<td>Strongly Disagree</td>
<td>Strongly Agree</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>1 New technologies contribute to a better quality of life</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Technology increases my mobility</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Technology gives people more control over their daily lives</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Technology makes me more productive in my personal life</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Other people come to me for advice on using new technologies</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 In general, I am among the first in my circle of friends to acquire new technology when it appears</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 I can usually figure out how to use new high-tech products and services without help from others</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 I keep up to date with the latest technological developments in my areas of interest</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Technical support lines are not helpful because they don’t explain things in terms I understand</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Sometimes, I think that technology systems are not designed for use by ordinary people</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 There is no such thing as a manual for a high-tech product or service that is written in plain language</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 People are too dependent on technology to do things for them</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Too much technology distracts people to a point that is harmful</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Technology lowers the quality of relationships by reducing personal interaction</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 I do not feel confident doing business with an organisation that can only be contacted online</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION THREE: Influence of Environmental Factors

When completing the rest of this survey, please answer the questions in terms of how they relate to your experience.

<table>
<thead>
<tr>
<th>Time Pressure</th>
<th>Please indicate the extent to which you agree or disagree with the following: (please circle only ONE number per line)</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time budgets have become tighter in recent years</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Internal audit personnel sometimes take work home, and don't report the time spent on it, so as to meet the time budget</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Review procedures in my department are adequate to detect early sign-offs on audits</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>There is a natural conflict between the concept of a time budget and the gathering of sufficient evidential matter</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>When the time budget is exceeded in one phase of an audit, the internal auditor feels a need to save time elsewhere</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>The time budget is a necessary management tool for the evaluation of an internal auditor</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The time budget has a significant influence on the internal auditor’s job performance</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>The performance of a specific audit procedure is the primary responsibility of the internal auditor performing that procedure</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>The inclusion of specific audit steps in the audit programme facilitates the proper overall conduct of an audit</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Audit Independence</th>
<th>Please indicate the extent to which you agree or disagree with the following: (please circle only ONE number per line)</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The internal audit function in Omani state organisations is independent of the management of the organisations they audit</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The internal audit function in Omani state organisations approves their own annual operations budget</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Internal auditors in Omani state organisations perform follow-up investigations to determine if management responded to their recommendations</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>It is common for internal auditors to move to other functions within Omani state organisations</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Internal auditors agree with managers of the organisations they audit the purpose of their investigation before commencing their work</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Internal auditors file written reports on issues raised</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Internal auditors report to a higher level in the organisation if management fail to respond to them</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
**SECTION FOUR: Influence of Technological Factors**

When completing the rest of this survey, please answer the questions in terms of how they relate to your experience.

<table>
<thead>
<tr>
<th>Technological Benefits</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I would be able to complete audit procedures more efficiently using CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2. I would do more work on representative samples, and less work on high risk samples if I could use CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3. Using CAATs would improve overall audit effectiveness</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4. Using CAATs would increase the likelihood of referrals to an investigations team</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. I would be interested in participating in more CAATs training if it were available</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technological Risks</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I would expect to encounter system problems (e.g., lockouts, connection issues etc.) that would impair the efficiency of my audit work</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2. I would expect to encounter significant CAAT-related problems on my audits if used</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3. How would you characterise the decision to adopt CAATs in your organisation?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4. How would you characterise the decision to use CAATs in your internal audit work?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. How would you characterise the decision to adopt CAATs in your organisation?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
SECTION FIVE: Influence of Individual Factors

When completing the rest of this survey, please answer the questions in terms of how they relate to your personal experience.

<table>
<thead>
<tr>
<th>Social Influence (SI)</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 People who influence my behavior think that I should use CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2 People who are important to me think that I should use CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3 Senior management in my organisation would be helpful to me in using CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4 In general, my organisation would support the use of CAATs as they probably would want me to use CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5 My manager would be very supportive of the use of CAATs for my job</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facilitating Conditions (FC)</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 I have the resources necessary to use CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2 I have the knowledge and the training necessary to use CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3 In all likelihood, CAATs would not be compatible with other systems I use</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4 Assistance would be available for IT system difficulties if I used CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Expectancy (PE)</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 I would find CAATs useful in my job</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2 Using technology would enable me to accomplish tasks more quickly</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3 Using CAATs would increase my productivity</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4 If I used CAATs, I would increase my chances of getting a pay rise</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5 By using CAATs I would spend less time on routine tasks and unproductive activities</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6 Using CAATs would increase the quality of the audit work I perform</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
### Effort Expectancy (EE)

Please indicate the extent to which you agree or disagree with the following; (please circle only **ONE number** per line)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It would be easy for me to become skilful in using CAATs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I find would CAATs easy to use</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Learning to operate CAATs would be easy for me</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Using CAATs may require a lot of my mental effort</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

**Thank You**

Thank you for completing this survey. Your participation in this study is very much appreciated. If you have any additional comments regarding your experience in the area of CAATs, please include them in the space provided below:

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
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___________________________________________________________________________