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THE EFFECTS OF ADOPTION OF DATA ANALYTICS ON AUDIT
EFFICIENCY. A CASE OF KPMG ZIMBABWE

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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Abstract

Audit clients have continuously developed big data which is difficult for auditors to work with, especially without corresponding digital tools. This research study was on the effect of adoption of data analytics on audit efficiency at KPMG Zimbabwe. Auditors at KPMG have been spending more audit hours and costs than expected and this is because of evolution of big data by clients which is difficult to work with without full implementation of data analytics. The main objective of this study was to explore the effect of data analytics on audit efficiency. Literature was reviewed on the two variables of the study data analytics and audit efficiency. Literature on sub-objectives was also reviewed so as to enrich the study and through that review, the research gap was determined. Descriptive research design and mixed approach method were adopted for the study. Data was collected through questionnaires and interviews. The targeted population was the KPMG external audit department and stratified random sampling and convenient sampling was used for questionnaires and interviews respectively. Secondary and primary data was used in the study. Data collected was mainly presented in the form of tables, graphs and pie charts. Data collected through questionnaires was analyzed quantitatively by use of descriptive statistics and to be specific measures of central tendency (mode) and measures of frequency (percent) were used. Data collected through interviews was analyzed using qualitative coding and analysis. Through the respondents of the questionnaires and responses by interviewees this research discovered that adoption of data analytics has a positive effect on audit efficiency and this was supported by other scholars who were reviewed in chapter two. This study recommended KPMG to fully adopt data analytics as this does not only improve audit efficiency but it also improves audit quality, effectiveness and client service. Though there are challenges encountered when using data analytics, the study also discovered solutions to address those challenges.

Key Words

Data analytics; Audit efficiency; KPMG Zimbabwe; External audit and Audit firms.

Declaration

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.

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Dedication

To my parents, “Richard Wushe and Ruth Wushe”, for your advice, love and faith in me.

List of Acronyms and Abbreviations

IAS	International Accounting Standards
ICAZ	Institute of Chartered Accountants of Zimbabwe
IFRS	International Financial Reporting Standards
PAAB	Public Accountants and Auditors Board
USD	United States Dollar
ZSE	Zimbabwe Stock Exchange
GAAP	Generally Accepted Accounting Principles
CAAT	Computer Assisted Audit Techniques

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CHAPTER 1 : INTRODUCTION

1.0 Introduction

In a dynamic world where technology is improving on a daily basis, the auditing profession is also slowly changing (Bender, 2017). The use or adoption of Data Analytics in the profession is believed to be the future of the audit (Byrnes, et al., 2014). The main aim of this research is to assess the effects of adoption of data analytics of audit efficiency. This chapter is there to give a clear picture of what the study is all about by taking a closer look at the background of study, statement of the problem, research questions and research objectives. The chapter will further elucidate the understanding of the study by covering significance of the study, assumptions used, de-limitations and limitations of the study. The chapter will close with a summary of the chapter.

1.1 Background of the study

According to Vanbutsele (2017), “data analytics is the future of the auditing profession considering the volume and complexity of data transactions that are being processed by companies (clients), it is quite essential to come up with data analytics which might improve audit efficiency and effectiveness”. Gershkoff (2015) states that “data analytics is a growing market and being a growing market its adoption by audit firms might have an effect on audit efficiency”. Auditing profession is about giving the individuals who use the financial statements a reasonable assurance, especially the investors and those charged with governance, thus this is the reason for the rise in expectations for this profession. For audit firms to meet these higher expectations they need to be effective and efficient in carrying out their work.

Data analytics are increasingly dominating the financial reporting process. According to a study by Deloitte (2013), “it noted that the finance and accounting division are increasingly investing in

analytics. Furthermore, other firms are planning to invest in technology and tools that will advance the use of data analytics in financial statement audits”. (EY 2017; Harris 2017) seem to agree that “adoption of data analytics is important as clients are now producing big data”. Liddy (2015) explains and supports the fact that “data analytics can improve risk assessment in auditing of which risk assessment is deemed to be so vital in auditing”. (Byrnes, et al., 2014) also expects a very good improvement on audit efficiency if data analytics are successfully implemented. In addition, Earley (2015), believes that “the adoption of data analytics will allow more transactions to be tested thus giving a better result than the result obtained when a sample is used”. According to Ramlukan (2015) “it is quite essential and necessary for audit firms to keep on investing in data analytics as this will help to produce more assurance and relevant audit”.

Alles (2015) also states that “audit firms need to invest in data analytics to remain competitive in the future”. (ICAEW, 2017) supports Alles as they state that “it is imperative that the auditing and finance sector invest in understanding and developing technology of data analytics as these benefits their respective sectors”. From the study by EY (2015) it states that “data analytics may bring a big transformation in the audit sector which will improve the results as the sample based will no longer be used”. In addition, (Vanbutsele, 2017) emphasizes that “auditing profession is facing challenges due to rise of big data which can be reduced by adoption of data analytics”. All these authors and researchers above seem to have a similar point of view and agree that the adoption of data analytics has an impact on audit efficiency.

From another point of view some scholars beg to differ that data analytics have an impact on audit efficiency. Bender (2017) states that “data analytics has no impact on audit efficiency because from his study audit efficiency is measured by audit hours, audit costs and billed costs which he says they do not change even if data analytics are to be implemented”. Bender (2017) also states that

“this does not implicate that data analytics are bad but the application of data analytics is still new and audit firms need time to adjust”. Financial Reporting Council (2017) states that “audit firms and teams feel pressure to promote the use of audit data analytic techniques on audits to meet audit committee expectations and to achieve efficiencies”. This may result in overemphasis of data analytics as they might not be prevalent as to what the market expects.

Researchers on data analytics have focused more on the adoption, factors which influenced the adoption and use of Data Analytics and Computer Aided Audit Techniques. From the study by (Mansour, 2016) “he focused on the use of technology in auditing and noted that there are significant factors which are leading to use of CAATs by external auditors”. Ayman et al (2017) support the study by Mansour (2016) by taking a closer look at factors affecting adoption of CAATs among external auditors. Results show that among other factors the size of the firm might contribute to the adoption of data analytics (Rosli et al, 2013). Gepp et. al, (2018) goes on to support other scholars by emphasizing on the need for audit firms to fully implement data analytics so as to catch up with transformation of data into big data by companies/clients. Most of the scholars mentioned above have been emphasizing on the reasons to adopt data analytics and it has been noted that effects of adoption of data analytics is an area which need further study.

Table 1. 1 KPMG external audit execution hours and costs comparison

Year	Budgeted hours at client X	Actual hours spent at client X	Variance hours	Budgeted Audit costs for client X (USD)	Actual costs as per hours spent X (USD)	Variance costs (USD)	Budgeted hours at client Y	Actual hours spent at client Y	Variance Hours	Budgeted Audit costs for client Y (USD)	Actual costs as per hours spent Y (USD)	Variance costs (USD)
2015	4 560	5 210	(650)	6 670	7 590	(920)	3 500	3 655	(155)	4 150	4 255	(105)
2016	4 560	5 300	(740)	6 670	7 720	(1 050)	3 500	3 875	(375)	4 150	4 370	(220)
2017	4 600	5 395	(795)	6 700	7 950	(1 250)	3 500	3 905	(405)	4 150	4 450	(300)
2018	4 600	5 405	(805)	6 700	8 050	(1 350)	3 500	4 055	(555)	4 150	4 620	(470)

Source: KPMG Great soft

Table 1.1 above shows that auditors at KPMG, spent more time at clients than the expected hours. It can also be noted that variances kept on increasing despite the fact that the team size and audit scope was not changing. However, one of the suspected reasons for continuous increase in variances was that clients are now developing big data each year which is difficult to work with when the firm is partially using data analytics. From the table above when auditors spent more time at client X they will not move in on time to the next client, which is client Y as it can be noted that variances were also experienced at client Y. This might cause auditors to miss reporting deadlines which will affect the firm and client relationship. Hours to be spent at a client are planned according to the audit fees charged, if auditors exceed the planned hours there will now be bursting the audit budget and the firm will have to incur the expenditure. A research needed to be done on the effect of adoption of data analytics as one of the suspected reasons for variances was that of evolution of big data by clients each year.

There is an expectation gap between the auditors and the users of financial statements, and there is an increase in technological advancement each and every day. This advancement in technology keeps on widening the gap with time this will keep the audit profession ineffective. (Wang, 2015) states that “it is quite essential for auditors to keep in track with changes and not slacken behind”. (Rouse, 2016) cements the point of Wang (2015) by suggesting that if researches are to be done the expectation gap might be reduced by use of data analytics. There is a common expectation gap of fraud detection which can be reduced with the adoption of data analytics if more research is done on data analytics thus according to Earley (2015). Data analytics can be used to enhance fraud detection due to more available data computerized tools which use mathematical principles but more research need to be carried out on the importance and effects of data analytics so that

both the auditors and users of audited financial statements can get more understanding (Alles, 2015).

Table 1. 2 Types of data and work performed by auditors

Type of data	Current practice (partially using DAs)	Potential future practice (Fully adopted DAs)
Financial data	Different types of samples are used to select the transactions to be tested. Auditors give judgment on sections which are not so material to be audited. Data analytics are mostly used on planning stage to asses' significant accounts. With the current practice sample sizes differ with each auditor and this leads to differences in judgement. What is material to one auditor might not be material to another.	Data Analytics tests the whole population thus there is no need for samples. Data analytics will identify anomalies and patterns in the provided data. This will raise the skepticism of auditors which might lead to further tests and misstatements might be uncovered. However, judgment to perform further tests depends with the auditor.
Non-Financial data	Enquiries with management are done and sometimes disclosure checklist is done depending with the judgment of the auditor. Information is mainly rolled over to the next period. Going concern assessment is also done.	Data analytics developed to run models or predictive analysis to aid auditors in identifying business risks and areas of focus during planning, aid in fraud detection, going concern assessment will also be done.

Source: KAM (2018) and Bender (2017)

Table 1.2 shows work performed when a firm fully adopts data analytics and work which is currently done with partial adoption of data analytics. The differences in work performed can deduce that adoption of data analytics might have an impact on audit efficiency. Besides having an impact on audit efficiency some expectation gaps can be closed. The current practice on the table was retrieved from KPMG Audit Methodology (KAM) and potential future practice was sourced from (Bender, 2017)

1.2 Statement of the problem

The evolution of time has brought about the presence of big data, at audit clients, that is difficult to work with. As a result, auditors as of present day now tend to take a bit more time at clients and this may also result in accounting firms having to miss the tight reporting deadlines of some of their major clients accompanied by the bursting of audit budgets. Even though KPMG, is doing its very best to advance its technology, so that it can go hand in hand with that at the audit clients, the firm has not yet fully adopted data analytics. If data analytics are successfully and fully implemented into the firm, this will act as an empowering force that will help auditors to analyze and audit large amounts of data, while testing the whole population in a timely manner (instead of making use of sampling which is not a hundred percent accurate). The reason why the firm has not yet fully implemented data analytics, is because researchers on data analytics focused more on the adoption, reasons to adopt and use of data analytics; leaving out the effects of adopting them hence audit firms are not sure of what will happen next. For the purposes of this research the author is going to focus on the effects of adoption of data analytics on audit efficiency so that the firm can gain assurance on the effects and consider full implementation of the data analytics.

1.3 Research objectives

The main objective of this research is to determine the effects of adoption of data analytics on audit efficiency. For this objective to be achieved, the following sub objectives are sought:

- i. To analyse the impact of data analytics on audit efficiency.
- ii. To explore the importance of data analytics in audit.
- iii. To examine the challenges encountered when using data analytics.
- iv. To identify other data analytics tools that may be implemented, which are not yet in use.

1.4 Research question

Main research question

What is the effect of adoption of data analytics on audit efficiency? A case of KPMG Zimbabwe.

Sub research questions

- i. What is the impact of data analytics on audit efficiency?
- ii. How are data analytics important in audit?
- iii. What are the challenges encountered when using data analytics?
- iv. Which data analytic tools can be implemented other than those already in use?

1.4 Assumptions/Hypothesis

The author used the following assumptions to carry out this research:

- There were no changes to the regulatory environment in which the research was carried out.

- All the respondents to the interviews and questionnaires gave truthful responses adequate enough to be relied on by the researcher.

1.5 Significance of the study

To the researcher

This research is a partial fulfilment of requirements of the researcher's Bachelor of Science (Honors) Degree in Accounting with Africa University.

To the audit firm KPMG

The research will state the importance of adopting data analytics. It will also help the firm with data analytical tools to adopt, which the firm has not yet adopted. Lastly the research will provide solutions that the firm can use to overcome challenges faced when using data analytics.

To the University

The research will provide guidance and literature to other researchers who would like to research on related topics.

1.6 Delimitation of the study

The research is only limited to KPMG Zimbabwe and it covers a specific period that is, 2020 to 2022.

1.7 Limitation of the study

- Accessibility of auditors – Auditors are ever busy and they spend most of their time out of the office, as they will be working at clients, so it was very difficult to collect data. Communications were then done through calls, emails and Google Meet.
- Financial constraints – There has been rapid increases in prices of almost everything in Zimbabwe some prices doubling the normal price. This made it difficult for the author to travel, from Mutare to Harare as it was a bit expensive. However, the researcher opted to use emails, google meet and so on, and minimized the frequency of travelling.
- Access to information – Audit firms pay more attention on confidentiality as they try by all means not to divulge their information to the public. This meant that the researcher had to wait for all necessary administrations to be done so that information could be shared. However, the researcher wrote a letter seeking for information assistance, the letter stated that the information will only be used for the purposes of study. The researcher will attach the letter, which was a form of agreement between the researcher and the firm, at the end of the research.

Chapter summary

In this chapter the researcher was introducing the research by outlining the background of the study, statement of the problem, research questions and research objectives. To strengthen the introduction significance of the study was explained and other factors like limitations and delimitations of the study were highlighted. The next chapter will review literature by other experts who researched on the related field of data analytics. The chapter will assist in answering the research questions.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

This chapter will be specializing on literature review by other scholars who researched on related field of data analytics. The chapter will look at the conceptual framework, empirical literature review and gap analysis. The two variables of this particular research, namely: data analytics and audit efficiency, will be discussed in depth under conceptual framework. To enhance the chapter, research questions and problems highlighted in the first chapter will also be covered under empirical literature review. Lastly the chapter will close with a summary.

2.2 Theoretical framework

2.2.1: Definition of key terms

Data analytics

Cao et al, (2015) defines data analytics as “a process of modelling, cleaning, inspecting and transforming big data so as to communicate patterns and information which will enhance decision making and suggestion of conclusions”. AICPA (2017) agrees with Cao (2015) as the research states that “data analytics is the art and science of analyzing and discovering anomalies and patterns of information through visualization, modelling and analysis”. IBR (2018) also defines data analytics as “a process of analyzing data sets in order to come up with conclusions about information contained by these data sets and this is done with the aid of software and specialized systems”. In addition, Soileau et al, (2015) also defines data analytics as “the separation of data into component parts so as to establish more meaningful information”.

Byrnes et al, (2014) further explains data analytics as “a way of planning and performing audit in a sophisticated or advanced way”. Moreover, Byrnes et al, (2014) argue that “data analytics are found in two distinct modes which are exploratory data analytics and confirmatory data analytics”. Coderre (2015) also explained data analytics as “an advanced way of application of computer assisted audit techniques”. Furthermore, Coderre (2015) noted that implementation of data analytics helps auditors to come up with insightful conclusions. KPMG (2020) describes data analytics “as a gateway into the digital future and as an automated auditing way which will improve audit quality”. Furthermore, KPMG (2020) explains data analytics as a model which can provide foresight, insight and hindsight to an audit as well as the route to unlock the value of audit.

Big data

From the definitions by Cao et al, (2015), AICPA (2017) and IBR (2018) it can be noted that data analytics are associated with big data. Kessel (2014) defines big data “as large and unstructured data produced by machines, transactions and people”. Beyer (2012) describes big data as data which is of high volume, variety and velocity. In the same vein Kessel (2014) in his research discovered another factor to describe big data which is veracity. According to Wen (2018) “big data is described as a collection of data with high complexity and high volume”. In support of the above scholars Bender (2017) also identifies big data with the volume, veracity, velocity and variety.

According to Bender (2017) “volume is described as the size of data being created and velocity is described as the momentum at which data is generated and analyzed”. Coyne et al, (2017) state that variety depicts that data can be produced in various distinct forms. Lastly, Nasser and Tariq (2015) states that veracity is all about the reliability of data. In agreement with the above scholars

Warner (2018) described volume, velocity, variety and veracity in simpler terms as data at rest, data in motion, data in many forms and data in doubt respectively.

Audit efficiency

Bender (2017) defines audit efficiency as “the number of hours taken to perform work and achieve the target and the total costs incurred in reaching the target”. Bender (2017) further on states that “there are three main variables which determine audit efficiency namely; hours spent to finish a task, costs of the audit and audit fee”. Fedaa (2017) defines audit efficiency as a way of achieving the target of the audit with very minimum resources. In agreement with Fedaa (2017), Agerberg (2017) also defines audit efficiency as “achieving maximum productivity with minimum wasted expense and effort”. Mack (2016) also describes audit efficiency as “being more economic with available resources to achieve a target”.

The Institute of Internal Auditors (2017) describes audit efficiency as “a comparison of the budgeted hours and actual hours spent by auditors in such a way that actual hours spent should be less than or equal to budgeted hours”. However, ICAEW (2017) states that “efficiency is not about cutting down hours but it is about getting to things that matter quicker and spending more time on them instead of digging slowly through random samples that often tell you very little”. As opposed to Bender (2017) who identified three variables for audit efficiency, Omoneye (2013) noted that “audit efficiency is mainly denoted by one variable which is, how competent the audit team is”. Capriotti (2014) also identified that “audit efficiency is determined by the coordination of the audit team, the more the team is coordinated the better the efficiency”.

Time spent on the audit

Bender (2017) argues that “time spent will be measured in total hours worked by the audit team since auditors record their time in hours”. Earley (2015) states that “auditors record their time in hours and each hour an auditor spent working on client’s information is accounted for as time spent on an audit”. Hossain et al, (2016) also added that “the size of the team has direct impact on the time spent, if the team is big more hours will be accumulated”. Briggs (2013) states that time spent on an engagement is also determined by the experience of the audit team, if team members have audited the client for a long time there will take less time to complete the audit since there will be aware of the environment. On another note, Hay and Davis (2014) alludes that “time spent auditing depends with size of the client, the bigger the client the more the time auditors need to complete the assignment”. Bender (2017) states that “for audit efficiency to improve time spent on an audit is expected to decrease”.

Costs of the audit

Earley (2015) pointed out that “audit costs depend on the hours spent on an audit engagement”. Bender (2017) adds on, that “the job level of employees recording hours on that specific engagement contributes to audit costs”. In agreement with Earley (2015), Briggs (2013) states that “costs incurred during the audit depends with number of hours spent auditing thus, if the time spent decreases costs will also be reduced”. In addition, Byrnes et al, (2014) suggest that “one of the main factors which denotes audit costs is the experience of the auditor, more experienced auditors incur more costs because they have a higher charging rate”. However, Hay and Davis (2014) suggests that “the size of a client being audited also determines the costs of an audit if the client is

big mostly it will require more human resources”. Furthermore, Bender (2017) states that audit costs need to decrease so that audit efficiency can improve.

Audit fee

Hossain et al, (2016) state that “in return of assurance services offered by an audit firm to a client, the firm receives audit fee”. IAASB (2016) stipulates that “the basis of audit fee must be included in the engagement letter”. Bender (2017) states that “audit fees need to be increased to improve efficiency”. However, Earley (2015) contradicts with Bender (2017) as Earley states that there is, no way audit fees can increase when the hours recorded at an engagement are decreasing furthermore, Earley (2015) points out that “audit fee is not a major variable on audit efficiency”. In addition, Hay and Davis (2014) suggest that “audit fees are determined by the size of the client and even if data analytics are applied audit fees will not change if the size of the entity have not changed”. Moreover, Hosseinniakani (2014) alludes that “audit fee cannot be determined as a major variable for audit efficiency”.

2.3: Literature Review/ Relevance of the theoretical frame to the study

2.3.1 The impact of data analytics on audit efficiency

According to Bender (2017) “audit efficiency can be measured using the three variables which are time spent at a client, costs of the audit and audit fee”. Alles (2015) states that “audit firms need to invest in data analytics as this improves audit efficiency and this will enable the firm to remain competitive in the sector”. In agreement with Alles (2015), Ramlukan (2015) also emphasize the

point for auditors to keep on investing in data analytics as they have a positive impact on audit efficiency. In the same vein, Gepp et al, (2018) highlights that “auditing profession is lagging behind in the valuable use of data analytics and auditors should quickly implement data analytics as this will enable them to finish assigned audit tasks earlier than before”. In addition, Ayman et al, (2017) support the above researchers as their research indicates that “computer aided audit techniques which are directly related to data analytics have significant impact on audit efficiency”.

Chan et al, (2020) in their research state that “automation and use of technology in carrying out audit assignments enhances audit efficiency and effectiveness”. Furthermore, DeBonhome (2017) alluded that “evolution of technology might limit the amount of time spent on manual analysis thus quickening the audit process”. DeBonhome (2017) further on states that “if time spent auditing is reduced, audit costs will be reduced as costs and time have a direct relationship”.

According to the study by ICAEW (2017) they highlighted that “technology will drive down the time taken to conduct an audit as testing will be more of automated”. ICAEW (2017) further on states that “if time spent on audit is reduced this will improve audit efficiency” as Vanbutsele (2017) mentions that time spent to carry out an audit is the major variable which depicts audit efficiency. From a research which was done by Austin et al (2020) in America it supports the study by ICAEW (2017) as the research highlighted that “use of data analytics reduces hours spent by auditors at clients”.

From a survey research which was carried out by Earley (2015) it highlighted that “firms which have fully adopted data analytics spend far much less time at clients than firms which are still using the traditional method of auditing”, however the research carried out by Earley (2015) only focused on the industrial markets clients and left out the banking sector clients. Appelbaum et al, (2015) cements “the fact that application of data analytics improves audit efficiency as they state

that application of data analytics will accelerate all the processes to be taken”. Moreover, Mansour (2016) in his research highlighted that “the main reason why audit firms are adopting data analytics is to improve performance expectancy”, and (Vermaut, 2016) defines performance expectancy as “the extent to which the users of a system, techniques or tools expects that using the system will help them to achieve gains in job performance”. (Byrnes, et al, 2014) also expect a very good improvement on audit efficiency if an audit firm implements data analytics.

However, from another point of view the research by Financial Reporting Council (2017) argued that “the use of data analytics in auditing is overrated in the market and might not be of that much importance to the audit”. Tang and Karim (2017) highlighted that “the shift from traditional audits to new technological ways of auditing is not because of audit efficiency but the main driver of application of data analytics is for auditors to meet client-side demands”. In addition, the study by Wen (2018) highlighted that “for auditors to perform efficient audits it is not about application of data analytics but matching relevant skills at both planning and execution stage of audit”. Wen (2018) further on clarifies that “data analytics might not have an impact on audit efficiency if relevant skills are not matched”.

AICPA (2012) white paper pointed out that “development of technology will pose more challenges to the profession which requires more attention on the adoption of up-to date auditing procedures”. Adrian (2013) states that “application of technology in auditing might decrease audit efficiency as some clients might produce noise data or restrict auditors to some of the data which in turn cause the auditor to spend more time seeking clarity from client and then spent more time again trying to use complicated tools to re-sort data”. Briggs (2013) in his research failed to take a position on the impact of data analytics on audit efficiency. Briggs (2013) states that “application of data analytics requires experienced senior auditors on the ground however, this increases costs if the

whole team is full of seniors and on another note if the firm is to use juniors they will take more time auditing as they will also have to understand the tools used but low audit costs will be incurred because junior auditors have a lower charging rate compared to seniors”.

On the same note, Centre for Financial Reporting Reform (2017) argues that “development of technology in auditing does not have an impact on audit efficiency rather it mainly affects audit effectiveness”. Hisham (2020) also agrees that “use of data analytics does not have an impact on audit efficiency”, Hisham (2020) further on points out that “human intervention is seriously required so as to point out if data analytics affect audit efficiency”. Nasser and Tariq (2015) states that “application of data analytics might cause audit efficiency to decrease that is if the data analytical tools implemented process data slowly”. In his research Bender (2017) agrees with the above scholars that the application of data analytics does not have an impact on audit efficiency. Bender (2017) states that “to determine if application of data analytics affects efficiency, the impact has to be operationalized”. From his study Bender (2017) concludes that “data analytics do not have an impact on audit efficiency as the variables are not operationalized”.

All the scholars above were arguing on the real impact of data analytics on audit efficiency as Alles (2015), Ramlukan (2015), Gepp et al, (2018), Ayman (2017), Chan et al, (2018) argues that application of data analytics and technology have an impact on audit efficiency whilst Bender (2017), Wen (2018) Financial Reporting Council (2017) and Hisham (2020) argues that “application of data analytics or technology does not have an impact on audit efficiency”. This motivated the researcher to further research on the effect of adoption of data analytics on audit efficiency so as to bridge the gap between the contrasting scholars and have a common ground on the effect of data analytics on audit efficiency.

2.3.2 Importance of data analytics in audit

1) Improves audit efficiency

As mentioned earlier Bender (2017) describes audit efficiency with three variables which are hours spent to perform audit assignment, costs incurred during the audit and audit fee. Bender (2017) goes on to highlight that “audit efficiency can be said it has been improved if all the variables have been operationalized”. Chao et al. (2018) state that “automation and use of technology in carrying out audit assignments enhances audit efficiency and effectiveness”. Appelbaum et al, (2015) agree with Chao et al (2018) as they state that “application of data analytics will accelerate all the audit processes to be taken”. Application of technology in auditing will limit the amount of time spent auditing as bulk of processes will now be automated thus according to DeBonhome (2017). DAWG (2016) in his research paper states that “use of technology in auditing reduces audit costs as a lot of work will be done by tools and techniques as opposed to traditional auditing where a number of auditors were supposed to perform all the processes thus increasing audit costs”.

Byrnes et al, (2014) agree with the above scholars that “data analytics improves audit efficiency as they highlighted the point that there is an expectation that audits will become more efficient with the help of data analytics”. From the study by PwC (2015) it highlighted that “data analytics can identify anomalies and measure a bulk of transactions, thus relieving the auditor from doing a lot of work as the auditor will now focus on a smaller sample of observations thereby improving audit efficiency”.

However, according to a research by KPMG (2018) “data analytics mainly improves audit quality as compared to audit efficiency”. Agerberg (2017) also highlighted that “data analytics do not play

a major role in improving efficiency rather they improve effectiveness”. Briggs (2013) highlighted that “it is not certain that application of data analytics will improve efficiency rather the study suggests that audit might actually become costlier”. Contradictions amongst authors above in relation to data analytics and audit efficiency motivated the research to be done on the effect of data analytics o audit efficiency so as to re-examine if really data analytics improves audit efficiency.

2) Increased effectiveness

According to the study by EY (2015), “audit effectiveness is defined as a composite of competence, quality control, procedural arrangements and quality assurance”. Centre for Financial Reporting Reform (2017) highlighted that application of data analytics increases the effectiveness of audit more than efficiency. Furthermore, Centre for Financial Reporting Reform (2017) clarifies that “audit effectiveness is improved as data analytics enables auditors to perform more frequent testing at shorter intervals unlike performing few tests at year end”. Byrnes et al, (2014) support the above research as their research states that “if a public firm fully implements data analytics it will be possible to perform 100% tests thus improving the results obtained unlike when sample basis is used”.

IFAC (2017) agrees with Centre for Financial Reporting Reform (2017) as their report states that data analytics can be used in assessing and evaluating large volumes of data quickly. IFAC (2017) further on states that “data analytics provide an extra insight on control and risk assessment”. EY (2015) states that “transformed audit will extend over sample-based testing to analysis of entire population due to use of smart analytics and this will assist to deliver improved results”. In addition, Agerberg (2017) states that “data analytics mainly improve audit effectiveness than any other factor in auditing”.

3) Improved client service

IAASB (2016) mention that “there is a development of stakeholder expectations regarding the use of technology in auditing, specifically client expectation”. Centre for Financial Reporting Reform (2017) indicates that “application of data analytics allows auditors to raise issues earlier thus improving communication between the auditors and client as auditors will be able to provide responses on time”. IFAC (2017) agrees with the research by Centre for Financial Reporting Reform (2017) as the report states that “if data analytics are successfully implemented, clients can see their everyday data analyzed in new ways, enabling a fresh look and the opportunity to understand their own information in a different perspective”. However, the research proposes to go beyond the above scholars so as to identify if data analytics will improve firm client relationship service. However, Earley (2015) argues that data analytics do not provide clients with competitive and innovative insights.

4) Enhances audit quality

The (IAASB, 2014) admits that the term ‘audit quality’ have no agreed definition that has achieved worldwide recognition since it constitutes a complex subject. Albeit (2014) also agrees with (IAASB, 2014) that it is difficult to define audit quality however, the scholar mentions that it holds within a number of key elements that creates an environment which likely maximizes the likelihood that audits that are of really good quality are performed. Defond and Zhong (2014) conclude that “no single category paints a complete picture of audit quality thus researchers should use multiple proxies to determine audit quality”. According to IFAC (2017) data analytic techniques enhances audit quality as these techniques enable audit teams to clearly analyze client’s

financial information early in the audit process which will enable auditors to identify areas which need further investigation. In addition, KPMG (2020) states that “application of data analytics is raising the bar on audit quality as it enables auditors to test entire population and understand for obtaining outliers and anomalies”.

DeBonhome (2017) also states that “data analytics can improve the quality of audited financial statements, if data analytical tools are used to obtain evidence during audit as they can discover and analyze deviations, patterns and inconsistencies”. ICAEW (2016) had a similar perspective on data analytics and highlighted that data analytics were developed to improve audit quality. In addition, Wang (2015) states that data analytics plays a pivotal role in improving audit quality. Liddy (2015) describes how data analytics can improve risk assessment and insights, and highlights the point that when risk assessment is improved it also results in improve audit quality. NBA (2013) strengthens the point that evolution of technology like data analytics in auditing will enhance audit quality. A research by Deloitte (2016) reviewed that application of data analytics can add richness, better insights and more understanding of risk which will eventually prompt audit quality. To add on (Earley, 2015) states that data analytics promises to improve audit quality by providing greater insights into audit processes.

Vanbutsele (2017) also highlighted that big data analytics is the future of the auditing profession and application of them will significantly improve audit quality. In agreement with the above researchers (Gershkoff, 2015) alludes that data analytics do not only improve audit efficiency but also improves audit quality. Mansour (2016) underlined some of the factors contributing to the adoption Computer Aided Audit Techniques which are synonyms with data analytics by auditors and one of the main factors is the need to improve audit quality. Rosli et al, (2013) agree with other scholars that audit firms need to invest in data analytics as this will have a positive impact on audit

quality. Financial Reporting Council (2017) sites that audit quality was cited by many firms as a driver for the implementation of audit data analytics. Arguments by the different scholars above on importance of data analytics motivated the researcher to further investigate on the effect of data analytics on audit efficiency and assess if the significance of data analytics will contribute to the effect of data analytics on audit efficiency.

5) Closes the expectation gap

There is an expectation gap between the auditors and the users of financial statements and technology is advancing each and every day (Bender, 2017). The more technology is advancing the more the gap is being widened (Wang, 2015). However, Wang (2015) in his research states that “if more research is to be done, data analytics can reduce the expectation gap”. Earley (2015) states that the most common gap of fraud detection can be reduced if data analytics are fully implemented by auditors in all their processes. Alles (2015) supports Earley (2015) by stating that “data analytics can be used to improve fraud detection due to more available data computerized tools”. The fact that if data analytics are implemented tests can be changed from sample based to 100% testing this can enhance fraud detection as the whole population will be tested (Byrnes et al, 2014). However, from another point of view, (ISA 240) indicates that “it is not the responsibility of an auditor to detect fraud thus the expectation gap might still stand between the client and auditor”.

2.3.3: Challenges encountered, when using data analytics

1) Expertise of auditors

Earley (2015) states that auditors are lagging behind when it comes to use of data analytics because they do not have the required skills to apply data analytics. Brown-Liburd et al, (2015) also

highlight that “application of data analytics require a different skillset from the one auditor possess that’s why auditors face challenges when using data analytics”. In addition, Adrain (2017) supports the above scholars as Adrain (2017) states that “technological developments in auditing have created complicated systems which is affecting auditors in using these systems”. ICAS (2017) also highlighted that “the main challenge faced by auditors in using data analytics is that they lack the right skills which enables them to use apply data analytics efficiently and effectively”.

Brown-Liburd et al, (2015) also suggest that “auditors are facing a challenge to recognize patterns and evaluate anomalies of big data using data analytics as this was never part of training for auditors during traditional days of auditing”. Wang (2015) supports other scholars above by highlighting that for first five or more years of implementing data analytics auditors spend more time auditing as there will be facing challenges in using data analytics. Data analysis requires the ability to interpret the analysis and substantial skills in performing the tasks which most of the auditors do not possess Laura (2018).

2) Data availability, integrity and relevance

Earley (2015) points out another major challenge which is on availability of data, data integrity and ownership of data. Earley (2015) goes on to highlight that clients might not capture information in a way which helps the auditor, furthermore the auditor might be restricted access to other data. According to Debreceeny and Gray (2014) “restriction to access client’s data is a major barrier which shadows the importance of data analytics”. Whitehouse (2014) states that “even if the client can provide full data and grant auditors full access there is need to consider integrity of data”. Liddy (2014) supports Whitehouse (2014) as Liddy states that “some of the data provided by clients lacks integrity and this is a very big challenge to auditors when using data analytics”. The PCAOB has also expressed concern on this issue as in their survey of inspecting public

company audits noted that some clients temper with data before releasing it to auditors. Alles (2014) also clarifies the point that data provided might not be complete which pose challenges to auditors when using data analytics. Adrian (2013) also supports the above scholars by stating that besides auditors being granted access to information some clients capture data in such a way that the auditor will have to spent more time seeking clarity from clients and sometimes re-arranging data using the data analytic tools which are complex to use.

3) System break down

Earley (2015) highlighted that “auditors face system breakdowns when using data analytical tools. The scholar noted that data analytical tools used by auditors might have breakdowns during the phase of an audit and this will cause auditors to take more time working on an engagement”. Adrain (2017) also states that “system breakdown is one of the major challenges encountered by auditors when using data analytical tools”. Further on, Adrain (2017) highlighted that auditors are not aware of how to solve some system breakdowns as some system breakdowns require specialists and this will impact audit efficiency as auditors will have to wait for the problem to be solved. Alles (2015) also pointed out that when there is a system breakdown some audit procedures will come to a standstill until the problem is resolved and this cause auditors to spend more time on an engagement.

Brown-Liburd et al (2015) argue that “when there is system breakdown some information might not be captured and, in some circumstances, data might be lost and this will affect the time taken to complete an audit as some processes will have to be re-done”. Kumar (2017) also noted that since these data analytical tools are installed in computers and some in client`s information system if those computers are affected by virus this will cause system breakdown thus affecting the audit. In addition, Laura (2018) alluded that some data analytical tools like embedded routines are

inserted in client's information system and if client's information system have breakdowns this will imply that even the auditors' tools will be affected.

4) Theft of data or data confidentiality

According to Kumar (2017) auditors are facing a challenge of theft of data when using computer tools to carry out audit. Kumar (2017) highlighted that data stored in a computer might be copied into floppies and the data will end up in the wrong hands thus breaching data confidentiality clause. Earley (2015) highlighted that since application of data analytics implies that most of the processes will be automated there is a chance that hackers might stole confidential data of clients and the tools used by auditors might be corrupted. In addition, Laura (2018) also indicated that client's data is prone to hackers when some data analytical tools are used and this might affect the firm-client relationship.

Mansour (2016) highlighted that "data analytical tools require more developed versions of computers which are fast". Brown-Liburd (2015) argued that "auditors are facing a challenge that some of the computers they use are not compatible for data analytical tools". In addition, Kumar (2017) highlighted that when data analytical tools are inserted in some of the computers being used by auditors, these computers will sometimes slow down and crash. Furthermore, Alles (2015) highlighted that "compatibility of hardware is one of the major challenges encountered by auditors in using data analytics". Alles (2015) also noted that "some data analytical tools are not compatible with client's hardware thus paving a risk of client's hardware being corrupted by these data analytical tools and all the blame will be on auditors".

2.3.4: Solutions to challenges faced

1) Training and education knowledge

Katz (2014) highlighted that there are several approaches that could be taken to address the challenges encountered. Earley (2015) suggests that audit firms must train their auditors and educate them on data analytics so that they can improve on their skills. Alexander and Gentry (2015) add on that audit firms must encourage universities to educate students about data analytics so that the firm will mainly focus on training the practical part. In addition, Brown-Liburd (2015) suggests that “audit firms must frequently conduct trainings to their auditors so that they quickly achieve the required skills for data analytics”. Further on, (Adrain, 2017) suggests that “audit firms need to adjust on recruitment requirements and include more of computer literacy so as to build a better future for the coming auditors”. Earley (2015) also states that “audit firms can outsource the majority of data analytics to offshore centers and provide auditors with the output of data analytics so as to inform additional auditing procedures”. AICPA (2014) suggests that “firms might use tools that automate as much of the process as possible and categorizing anomalies into manageable ‘buckets’ so that auditors can apply judgment I addressing the smaller number of anomalies identified by these tools”. Bieger (2015) states that “other big firms have Information Technology Specialists who will assist when there any challenges faced”.

2) Access to data

According to Bender (2017) “the auditor must be given access to all data without interference of the client”. Whitehouse (2014) suggested that “in order to be confident that data which is to be analyzed is trustworthy and complete an Information Technology Specialist is required to sort and process the data”. Bender (2017) argues that “auditors consider extraction of data the biggest challenge for applying data analytics and this can only be solved if auditors are allowed to extract data by themselves as this will increase integrity of data”. On the same note (Brown-Liburd et al, 2015) highlighted that if the auditor extracts data on his own this will also improve on the reliability

of data as, Michael and Uday (2018) suggests that this can be achieved by application of evolving techniques one of data analytical tools which restricts manipulation of data.

3) Back up

Kumar (2017) highlighted that auditors must have back up plans in place in case of system breakdowns so that audit work will not stop due to system breakdowns. Furthermore, Kumar (2017) noted that “it is necessary to take frequent backups of all software and keep them separate from the usual media so that even if there are break downs and some of the data is lost auditors can easily retrieve that information”. Alles (2015) also states that “frequent backups should be done when using these analytical tools in case auditors’ computers might be lost or stolen data from the client will be readily available”. In addition, Whitehouse (2014) states that “backups should not only be done but security for backups should also be done”. Mansour (2016) highlighted that “backups should be kept in secure place, loss of backups impacts both the client and auditor”.

4) Data encryption

Mansour (2016) highlighted that auditors must encrypt their computers with passwords as their computers contain all confidential information when auditors are applying data analytics. Kumar (2017) also highlighted that when auditors are applying data analytical tools, controlling of hardware and software should be the first security. Further on, Kumar (2017) also highlighted that “since application of data analytics is use of computers in auditing there must be strict security such as restricted access to systems and limited after-hour use”. In addition, Alles (2015) noted that “access to system or software must have password and these passwords must frequently be changed so as to avoid unauthorized access of data”.

5) Recruitment of Information Technology department

Bieger (2015) states that “audit firms must have a department for information technology which be assisting auditors to carry out their audit processes”. Furthermore, Bieger (2015) highlighted that “firms should recruit highly qualified personnel under the department”. Mansour (2016) add on to highlight that information technology department will assist the firm to restore if there are system breakdowns and auditors will not have to wait for outside specialists to solve the problems as the firm will already have information technology specialists readily available. In addition, Blanchard (2014) highlighted that if an audit firm have an information technology department audit costs will be reduced compared to when a firm is to outsource a specialist every time. However, Capriotti (2014) argued that audit costs can only be reduced if an audit firm have two sub departments under information technology which are Information Technology Audit (ITA) and Information Technology Systems (ITS). Furthermore, Capriotti (2014) states that “ITA will be made up of specialists who will be part audit teams and will be specializing on auditing information systems of a client to determine if it’s reliable and ITS will be specializing on hardware, fixing breakdowns and making sure that all systems, software and hardware are highly protected or encrypted”.

2.3.5: Other data analytics tools that may be implemented

Alles (2015) noted that CAATs have become synonyms with data analytic tools and techniques in auditing. Chartered Institute of Internal Auditors (2019) defines CAATs as use of technology to assist in evaluating audit process by examining and extracting relevant data. Chartered Institute of Internal Auditors (2019) further describes sophisticated use of CAATs as ‘data analytics.’

1) Embedded audit routines

Roger et al, (2012) describes Embedded Audit Modules as auditing testing tools that are used to perform substantive procedures and compliance. Roger et al, (2012) further describes that these tools can be found in three types which are snapshots, integrated test facility and on-line audit. Jackson and Stent (2014) further on added that these routines are intended to improve auditing processes. In support of Roger et al, (2012), Gartner (2013) describes embedded audit routines as audit routines which are built into client's computer system. Gartner also categorizes them into three types which are similar to the ones identified by Roger et al, (2012). Michael and Uday (2018) describes embedded audit routines as a technique of inserting an audit module within the client's information systems for the purposes of capturing information required for auditing.

Strengths of embedded audit routines

Gartner (2013) states that "the main advantage of embedded audit routines is that they are concurrent tools, the scholar further on explains that they operate at the same time as the client's applications". Jackson and Stent (2013) also state that "with embedded audit routines the whole period under review is covered and this improves efficiency of audit". In addition, Bender (2017) states that "it is not complicated to use the routines as a lot of processes are automated thus no or less costs are incurred to train auditors". Furthermore, Bender (2017) states that "since a significant of processes are automated time spent to perform audit will be reduced".

Drawbacks of embedded audit routines

Alles (2015) contradicts with Bender (2017) as Alles (2015) states that these tools do not have an impact on audit efficiency. Roger et al, (2012) also argue that these tools are very expensive to implement as they require Information Technology Specialists to create systems which are compatible with client's information system. Moreover, Jackson and Stent (2014) argues that the

main challenge with embedded audit routines is that if fabricated data is not coded correctly it can be distorted by client's data. Furthermore, Jackson and Stent (2014) argues that "there is high risk that clients can manipulate embedded audit routines for fraudulent purposes".

2) Snapshots

Jackson and Stent (2014) state that "snapshots are inserted in client computer applications and they capture images of transactions at various stages of processing". Roger et al, (2012) also highlighted that these snapshots enable the auditor to track the processing of data and evaluate the processes executed on to the data.

3) Systems Control Audit Review Function

Jackson and Stent (2014) describe this tool as an on-line audit which involves embedding audit software modules within the system to provide continuous monitoring of transactions. Gartner (2013) states that "this tool can be used to test controls or for substantive applications".

4) Integrated test facility

Roger et al, (2012) describe integrated test facility as similar to test data and may be used to test programs concurrently with normal live processing. Gartner (2013) further states that "with integrated test facility, typically test transactions are posted to a dummy unit during normal processing cycles". In addition, Mansour (2016) suggests that even if integrated test facility is almost similar to test data, integrated test facility is more efficient and effective as it can perform a variety of tests which cannot be done by test data.

5) Program Code analysis

Jackson and Stent (2014) describe program code analysis as a tool which involves the investigation of program coding of production programs to ensure that the necessary programmed controls are present, and that the program is coded correctly. Alles (2015) also describes program code analysis as data analytical tool which requires high level of technical technology. Bieger (2015) highlighted that program code analysis is data analytical tool which ensures that program is coded correctly and necessary controls are available.

Strengths of program Code analysis

Jackson and Stent (2014) suggested that program code analysis enhances test of controls and substantive procedures on programmed controls of a client. Mansour (2016) also highlighted that program code analysis helps auditors to develop improved expertise and this will help in coming up with a better audit quality. Furthermore, Adrain (2017) suggests that application of program code analysis will assist in achieving improved client servicing. Adrain (2017) further on states that “this data analytical tool reduces costs of an audit thus improving efficiency as there is no need for auditors to hire an expert when they want to audit programmed routines of a client. In addition, Mansour (2016) highlighted that with program code analysis the risk of relying with the expert is reduced and it cuts down hours spent by auditors assessing the qualifications and competencies of an expert.

Drawbacks of Program Code analysis

Alles (2015) argues that program code analysis is very much complicated analytical tool which needs high expertise. Furthermore, Jackson and Stent (2014) contradicts with Alles (2015) as they suggest that program code analysis is expensive to implement and more costs are incurred in training auditors on how to use the tool. Mansour (2016) highlighted that another weakness of

program code analysis is that if program documentation under review does not relate to the production programs in use no results will be obtained.

6) Evolving techniques

Alles (2015) states that “evolving techniques are audit software which uses forms of artificial intelligence and expert systems to simulate human judgment in carrying out assigned audit tasks”. Bender (2017) also describes evolving techniques as audit software which uses direct extraction of client data from client’s computer system for use in the auditor’s electronic working papers. Furthermore, KPMG (2018) describes evolving techniques as a form of block chain service which is designed to resist modification of data. In addition, Michael and Uday (2018) states that “evolving techniques is a sophisticated and upgraded way of application of computer aided audit techniques”.

Strengths of evolving techniques

Michael and Uday (2018) suggests that the main advantage of evolving techniques is that client’s data and information is never manipulated thus better and more realistic result can be achieved. Furthermore, Michael and Uday (2018) states that “evolving techniques reduce auditors’ reliance on client computer personnel”. Gartner (2013) also highlighted that evolving techniques assist in improving audit efficiency as auditors can easily extract data directly from the client whenever they want unlike to request for data and wait for the client to respond. Alles (2015) indicated that another advantage of evolving techniques is that they help to achieve more precision and better conclusive results.

Drawbacks of evolving techniques

According to Michael and Uday (2018), state that, these are very complicated techniques which are very difficult to use. Gartner (2013) argues that evolving techniques can create conflict between auditors and the client in the sense that the client can impose that auditors used wrong information since auditors directly extracted data on their own. Alles (2015) suggest that evolving techniques are very expensive to implement however, Bender (2017) contradicts with Alles (2015) as Bender (2017) argues that they are cost effective in long run as more costs are just incurred on implementation stage.

7) Audit Retrieval Software

Aries and Lusianah (2016) defines audit retrieval software as “usage of programs which read data files, process data, select and analyzes data, create files and print reports for use by the auditor”. Rindang (2016) also describes audit retrieval software as an application software that help auditors to retrieve, evaluate and summarize electronically coded data files. According to a research by Mahzan and Lymer (2014) they noted that audit retrieval software is a sophisticated way of computer aided audit techniques and they described the software as a software application which can perform different tasks such as casts, recalculations, sampling, summarize, comparisons, generate reports and perform investigations and analysis. Furthermore, in their survey research Mahzan and Lymer (2014) noted that big four firms have partially implemented audit retrieval software as they mainly use applications for sampling and generation of reports only. Mahzan and Lymer (2014) further on states “that audit firms need to implement all other applications under retrieval software as this will enhance audit efficiency, effectiveness and quality”. In addition, Jackson ad Stent (2014) describe audit retrieval software as upgraded program which is used to extract, analyze and reformat data extracted from client’s information system.

Strengths of audit retrieval software

Jackson and Stent (2014) state that “audit retrieval software if fully implemented can improve audit efficiency and effectiveness as most of the work which was done manually like comparisons can be done by applications”. Aries and Lusianah (2016) also suggested that if audit retrieval software functions are fully implemented audit quality will also be improved. Furthermore, Van Der Nest et al, (2017) highlighted that the functionalities of audit retrieval software enable the auditor to identify irregularities and anomalies that may be representing material misstatements. Wen (2018) also added that when audit retrieval software is fully implemented it can work with big data easily and this will reduce time spent by auditors at clients as one of the reasons why auditors delay is evolution of big data by clients.

Drawbacks of Audit Retrieval Software

Mansour (2016) indicated that it is expensive to fully implement audit retrieval software. Furthermore, Mansour (2016) indicated that application of audit retrieval software increases audit costs as there is need to pay license fees for audit retrieval software. Jackson and Stent (2014) also alluded that the software is complicated and difficult to use. Aries and Lusianah (2016) highlighted that if there is system breakdown audit might come to a standstill as most of the processes will be done by the software and this will cause auditors to spend more time on auditing thus decreasing audit efficiency. However, Wen (2018) indicated that with time solutions to all the problems encountered will be discovered.

2.3.6: Research Gap

The review of various related literature has unburied the reasons for carrying out a research on the effect of adoption of data analytics on audit efficiency. Researchers reviewed have brought inconsistent views in relation to the subject matter under study.

Alles (2015) and Ramlukan (2015) in their researches agreed that audit firms need to invest in adoption and implementation of data analytics as this have an impact on audit efficiency. Byrnes et al, (2014) also emphasized that use of technology in auditing have a positive impact on audit efficiency. Chao et al, (2018) in their research state that application of data analytics in auditing means a lot of processes will be automated thus processes will take short time to be completed. DAWG (2016) reflects that use of technology in auditing reduces audit costs incurred as a lot of work will be automated thus few auditors will be on ground.

On another note, researches by EY (2015) and IFAC (2017) indicated that data analytics have a greater impact on audit effectiveness than efficiency. Bender (2017) in his research contradicts with above scholars as Bender (2017) states that data analytics have no impact on audit efficiency because the variables of audit efficiency are not operationalized when data analytics are applied. In the same vein, (Adrian, 2013) states that adoption of technology in auditing might actually decreases audit efficiency. Wan (2018) highlighted that data analytics do not improve audit efficiency rather what determines audit efficiency is the skill set possessed by auditors. IAASB (2014) highlighted that application of technology improves audit quality only, however from a report which they issued in 2016 it mainly focused on the fact that application of technology in auditing improves client service, contradicting with the first report which was issued in 2014. According to the research by Briggs (2013) failed to identify if application of data analytics has an effect on audit efficiency as his research highlighted that application of data analytics might decrease hours spent on audit if senior auditors are used but this will increase audit costs and on

the other hand audit costs can be reduced if junior auditors are used however, they might take more time auditing again. For this reason, Briggs (2013) highlighted that effect of application of data analytics on audit efficiency is an area which needs further study.

Brown-Liburd (2017) and ICAS (2017) in their researches highlighted that there are major challenges encountered when using data analytics which might cause audit efficiency to decrease. However, Earley (2015) highlighted that even if challenges are encountered in using data analytics there have solutions which if implemented improves audit quality. Bender (2017) contradicts with Earley (2015) as from his research points out that in trying to provide solutions for challenges encountered when using data analytics more hours might be executed and the firm might engage extra staff like Information Technology Specialists which will in turn increase audit costs. The review of above scholars highlights that they are contradictions and inconsistent views when it comes to the effect of adoption of data analytics on audit efficiency. This instigated the research to be done so as bridge the gap of contradictions by different researchers. Researchers like Bender (2017) covered the effects of data analytics but his research was confined to Deloitte USA only. Bender (2017) indicated that there is need for further research on effects of data analytics on audit efficiency in other regions with different economic environment of USA and this research propose to further study on the areas highlighted by Bender (2017) by concentrating on a different firm in different region. There is also need to use a different research design from the one which was used by reviewed scholars so as to examine the real effect of adoption of data analytics on audit efficiency.

Chapter summary

In summary, this chapter looked at literature review on the effects of data analytics on audit efficiency. A detailed scholar review was given on the effect of data analytics on audit efficiency.

The chapter also covered the conceptual framework which looked at the two main variables of the research which are data analytics and audit efficiency. Through empirical literature review research questions and objectives were addressed. The chapter also covered the research gap analysis. The next chapter will be chapter three, which will focus on the research methodology adopted in this study which will help in collection of data and evidence to answer and address the research questions.

CHAPTER 3: METHODOLOGY

3.1: Introduction

The main purpose of this chapter is to clearly demystify research methods which were used in collection of data so as to accomplish the objectives of the study. The chapter will look at the research design, population, sampling, data collection instruments, data collection procedures, analysis and organization of data and lastly, ethical considerations. Justification for research methods adopted will be given. The chapter will then close with a chapter summary.

3.2: The research design

Creswell (2014) defines research design as “a strategy on how data is collected and analyzed efficiently”. Akhtar (2016) describes research design as “the structure of research which binds elements of the research together”. Gray (2014) highlighted that research designs assist researchers to perform researches easily and in a systematic way. In addition, Creswell (2014) states that, “research design is an overall plan that allows the researcher to gather answers to the research questions”.

Descriptive method (research design that was used in the study)

Ihantola and Kihn (2011) state that descriptive research methods basically describe situations and scenarios. Flick (2011) also highlighted that descriptive research depicts a situation on the ground. Descriptive research aims at addressing research questions of the study. Churchill and Iacobucci (2015) state that “descriptive research attempts to obtain quantifiable information which is utilized to statistically analyze the main objective under study”. In this study descriptive research was used to address research questions through questionnaires which were administered. These questionnaires helped the researcher to get a description of real situations on the ground with regards to application of data analytics at KPMG. Through descriptive research the researcher was able to establish the effect of the independent variable (data analytics) on the dependent variable which (audit efficiency). The researcher also used descriptive research because it addresses the ‘what’ question, and this is the main research question of the study.

3.3: Population and sampling

Population

Yin (2014) defines a research population as “the total number of the targeted individuals that are deemed vital in coming up with research data”. In order to ascertain the effects of data analytics on audit efficiency, the author used KPMG banking and finance external audit department as the targeted population. The targeted population comprised of audit partners, managers, assistant managers, supervisors, audit senior associates as well as junior associates.

Sampling

Sample is a subset representing the whole population (Sanders, 2013). Yin (2013) also defines a sample as “a set of elements less than 100% of the entire population”. Converse et al, (2013) noted that an effective sample should be more than 30% of the population. In agreement with Converse

et al, (2013), Jalil (2013) also highlighted that minimum size of a sample should be 30% of the population. On the other hand, Tella (2015) also noted that having a larger sample does not guarantee obtaining effective results.

Sample size

Archibald et al, (2015) state that “for every population below 350, the minimum sample size of 30% yields effective and reliable results”. In agreement, Christ (2014) proposed that 30% can be used as the minimum sample size if the population is less than 400. However, Christ (2014) emphasized that using 30% as minimum sample size and getting more than 50% response rate makes results very reliable. From the basis of the above scholars, the researcher used a sample size of 43.75% for questionnaires which is more than the minimum stated of 30% thus a sample size of 43.75% for questionnaires is justifiable.

For interviews sample size does not influence the quality of results as interviews are more qualitative than quantitative (Holloway and Wheeler, 2013). The researcher selected to interview the management level and picked a sample size of 3 managers which is 50% of the total population of audit managers. The 50% sample size for interviews is justifiable because for interviews there is no minimum sample size recommended, though the sample size is above the 30% recommended for quantitative. The researcher could not perform 100% on interviews because the researcher realized that interviews take more time and it will not be realistic to perform all the interviews, rather the researcher opted to perform a reasonable number of interviews, effectively by exploring more detail and taking note of all the responses.

Table 3. 1 Population and Sample size

Description	Targeted population	Selected Questionnaires	Sample size	Selected Interviews	Sample size
External Audit Partners	5	1	20%		
External Audit Managers	6	6	100%	3	50%
Audit Assistant managers	9	7	77%		
Audit Seniors	20	11	55%		
Audit Juniors	40	10	25%		
TOTAL	80	35	43.75%	3	50%

Source: KPMG Human Resources

Non-probability sampling: Convenience sampling

Snelson (2021) describes convenience sampling as “a non- probability sampling technique which relies on selecting members that are reliably available and those who are likely to respond when carrying out a research”. The researcher used convenience sampling to select members for interview purposes.

Justification for Convenience sampling

The researcher used convenience sampling to select managers for interviews because many auditors spend their time at clients. For that reason, it is difficult to access auditors, when they are at different clients with the exception of partners and managers who perform most of their work at the office. The researcher selected some of the managers for interviews because they can be found

easily at office, however partners were not selected because most of the time their schedules will be fully booked by clients.

Probability sampling: Stratified random sampling

Pandey and Pandey (2015) state that “stratified random sampling is a probability method of sampling which divides the population into strata based on same characteristics from which predetermined units or items are randomly picked”. Gray (2014) highlighted, this method might be complicated to use but it’s more objective. The researcher used this method to select a sample by dividing the external audit department according to job levels and picked members randomly from each job level so as to give everyone a chance to be selected.

Justification for stratified random sampling

The researcher used stratified random sampling for questionnaires in order to achieve the main objective of the study which was to determine the effects of adoption of data analytics on audit efficiency. There was need to get information from all levels as different levels would use data analytical tools differently, thus they might see different effects. This enabled the researcher to come up with more effective results as the researcher was able to note how the partners, managers, audit assistant managers, seniors and juniors view the impact of data analytics on audit efficiency.

3.4: Data collection

1) Questionnaire

According to Jenny (2014) a questionnaire is defined as a list of formal questions which are used to gather information from respondents. Pandey and Pandey (2015) also states that “a questionnaire

is a research instrument which is made up of either open-ended questions or closed-ended questions”. Further on Jenny (2014) states that “a questionnaire is an effective research instrument as the respondent is able to express true answers even if they are negative as there is no face to face interaction”. However, Black (2015) argued that “questionnaires have a disadvantage of that some respondents might not answer other questions and other questionnaires might not be returned thus affecting the quality of results to be yield”. For the purposes of this research questionnaires were distributed to the selected sample under external audit department of KPMG.

- **Closed-ended questions**

Closed-ended questions are the ones in which explicit answers will be given and the respondent will be limited to the provided answers (Best, 2015). The main advantage of using closed-ended questions is that they are easy to predict data statistically (Jackson, 2016). Moreover, Oakshott (2016) states that use of closed-ended questions is time effective. However, Best (2015) noted that using closed-ended questions will be limiting more data from respondents thus no additional data can be obtained from respondents.

Justification for Closed-ended questions and Questionnaires

The researcher used questionnaires in this study as one of the research instruments so as to gather more data from the field in a very short time. The researcher also used questionnaires since the way there are designed helps to address the research objectives effectively. The researcher also opted for questionnaires because they provide more unbiased data as respondents can feel free to give true answers thus helping in obtaining the actual effects of data analytics on audit efficiency. The questionnaire which was used had closed-ended questions because the researcher noted that

closed-ended questions are easy to analyze data statistically. Moreover, closed-ended questions take less time for respondents to answer and return questionnaire.

- **Likert Scale**

The questionnaire used in this study used the Likert scale to gather answers or data for the closed-ended questions which were used on the questionnaire. Mertler (2014) states that Likert scale is used to represent attitude of the respondents towards questions asked. Likert scale ranges from “strongly disagree” to “strongly agree”. Responses are rated from 1 to 5 where 1 is (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree) and lastly 5 (Strongly Agree). This is illustrated in Table 3.2 shown below.

Table 3. 2 Likert Scale and Rating

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Source: Chimi and Russel (2012)

Justification for Likert scale

For the purposes of this research, the Likert scale was used on the questionnaire because it enabled the researcher to easily determine the effect of data analytics on audit efficiency. This is because ratings 1 and 2 denotes negative effect of the area under study whilst 4 and 5 entails that there is a positive effect. The researcher also used the Likert scale because it makes data analysis easy, as answers or data can be analyzed according to rankings.

2)Interviews

Hudson (2013) describes an interview as a formal data collection instrument which is made up of questions which are asked by the interviewer (researcher) and the interviewee will be giving responses, and at the same time the interviewer will be taking down the responses for analysis. Mertler (2014) states that there are various forms of interviews that can be used. For the purposes of this research semi-structured interviews were conducted. Semi-structured interviews are interviews which are guided by an interview guide but questions are not asked in an orderly manner as follow up questions might arise (Mertler, 2014). In addition, Hudson (2013) states that semi-structured interviews use both open-ended and closed-ended questions as it allows more of a discussion between the two members.

Justification for Semi-structured interviews

The researcher used semi-structured interviews in this research because they are more qualitative and they enabled the researcher to get more information and clarity on grey areas as interviews had both open-ended and closed-ended questions. The main objective of this research was to determine the effect of adoption of data analytics on audit efficiency. In order to strengthen the results obtained, the researcher used semi-structured interviews which enabled the researcher to obtain more information which was not obtained when the researcher was making use of questionnaires.

3.5 Pilot study

N/A (not necessary)

3.6: Data collection Procedures

To address research questions and objectives of the study, data was collected using questionnaires and interviews. A sample for questionnaires was drawn and a sample size of 43.75% of the KPMG external audit population was used which comprised of 35 participants. As for interviews the researcher used management level as the population and 3 out of 6 managers were interviewed. A request letter was first sent to KPMG so as to earn permission to access data from employees. When the permission was granted the researcher distributed the 35 questionnaires at KPMG offices so that the respondents would remain anonymous and to ensure that the respondents received the questionnaires. The researcher also conducted interviews with the managers which were available that day, and documented all responses from the interviews. The researcher then made a follow up on the questionnaires which were still outstanding.

3.7: Analysis and organization of data

Data obtained from questionnaires and interviews was deemed to be raw and for it to become more meaningful it was analyzed. In this study data was analyzed statistically and it was more of quantitative in nature, for that reason descriptive statistics were used to analyze quantitative data obtained from questionnaires. In particular the researcher used measures of central tendency and measures of frequency under descriptive statistics for data analysis. The researcher mainly used mode under measures of central tendency to analyze data obtained from questionnaires. The researcher used mode to analyze data because the study adopted the Likert scale for questionnaires thus mode makes it easier to draw conclusions since the researcher will be basing on responses given according to the Likert scale ratings. With regards to measures of frequency, the researcher

mainly used percent and count to analyze data from questionnaires. The researcher used percent because it is easy to interpret, understand and to draw conclusions.

With regards to qualitative data which was obtained through interviews the researcher adopted qualitative coding and analysis. Locke et al, (2015) suggested that qualitative coding and analysis is the best method to analyze data from interviews. Maxwell (2013) also states that “qualitative coding and analysis is the best way to analyze interview data”. For the purposes of this study the researcher used qualitative coding and analysis because some of data was collected through interviews and there was need to analyze such data.

Data obtained from the field was presented or organized using tables, graphs and pie charts, for easy analysis. In some cases, a combination of pie charts and tables or graphs and tables were used. This study used tables, graphs and pie charts to organize data because they work as precise and concise tools to delineate data. These tools were used for organization of data because they enable results to be clearly noticeable. Data which was in groups or ranges, for example the working experience was presented using histograms. Tables were mainly used to organize data obtained through the Likert scale because the Likert scale already looks more like a table and if data is organized in table it becomes easier to understand.

3.8 Ethical considerations

Audit firms are so particular with confidentiality of information and it's one of their major ethical issues. In this research the researcher made sure that confidentiality was met as respondents were asked not to write their names on the questionnaires and all information which was obtained was solely used for academic purposes. The researcher also indicated on the questionnaire, as well as on the request for permission letter, that all information obtained was to be used, for academic

purposes. For interviews the confidentiality clause of the firm restricts use of any devices to record any KPMG members thus the researcher took minutes and noted down all the responses during the interviews.

3.9: Summary

In a nutshell, this chapter basically covered research methods which were used to obtain data or to gather evidence for the study. The chapter looked at the population, sampling, data collection instruments, data collection procedures, analysis and organization of data and finally, ethical considerations. The next chapter which is chapter four will be focusing on data presentation, analysis and interpretation for data collected through use of methodology discussed in this chapter.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1: Introduction

The previous chapter looked at methods which were used for data collection and this chapter will be looking at data presentation and analysis. To ensure that raw data which was collected presents an insightful meaning and results, it needs to be well presented and analyzed which this chapter will do. The chapter will present data collected through questionnaires and interviews by means of graphs, pie charts and tables. Data was also analyzed statistically and cases where data could not be analyzed statistically qualitative approach was used.

4.2: Data presentation and analysis

Demographics

Response rate

The researcher used questionnaires and interviews as research instruments and the KPMG external audit department was used as the research field. An analysis was therefore done for each instrument.

Questionnaire response rate

In this research 35 questionnaires were prepared and they were distributed to KPMG external audit department using stratified random sampling as noted in the previous chapter. Out of the 35 questionnaires which were distributed, 33 were responded to by the respective individuals.

Table 4. 1Questionnaire Response Rate

	Audit Partner	Audit Managers	Audit Supervisor	Audit Senior	Audit Junior	Total
Questionnaires distributed	1	6	7	11	10	35
Questionnaires responded to	0	6	6	10	10	32
Questionnaires not responded to	1	0	1	1	0	3
Response rate percentage	0%	100%	85.71%	90.90%	100%	91.43%

Table 4.1 shows that response rate for questionnaires was analyzed according to each group. According to Christ (2014), if sample selected is at least 30% and responses returned is more than 50%, data obtained can be said its reliable and effective results can be yield. The table shows that all the response rates for each group were far much above 50% with the exception of audit partner which had 0%. However, even if the partner's response rate was 0% overall a sample of 35 was selected with sample size of 43.75% which is above the minimum of 30% and 32 were responded to, giving a response rate of 91.43% which is above 50%. In addition, the partners only constituted less than 5% of the sample size thus having a response rate of 0% on partners did not affect the effectiveness of results yield. Basing on the study by Christ (2014) it can be deduced that response rate from the questionnaires was good and results obtained were more reliable and effective.

Interview response rate

The researcher used managers as the population for interviews. From the panel of managers, the researcher picked three managers using convenient sampling thus resulting in a 50% sample size

for interviews. The researcher was able to conduct all the three interviews thus making it a 100% response rate for interviews. Table 4.2 below shows the number of interviews which were selected and interviews which were conducted.

Table 4. 2 Interview Response rate

Respondents	Scheduled interviews (sample selected)	Conducted Interviews	Response rate
Audit Managers	3	3	100%

Source: Primary data

From Table 4.2 above it can be deduced that all information which was planned by the researcher to get from interviews was obtained as all interviews were conducted. In addition, it can be deduced that information obtained was reliable as the researcher was able to conduct interviews on three different managers.

General details

Response According to Gender

The questionnaire which was designed, differentiated gender of the respondents. This was done so as to get more views from both genders, as Morris (2014) states that females and males have different perspectives and reactions to use of technology in business. In addition, Boyer and England (2017) further on state that males easily adopt and face less challenges when using advanced technology in business as compared to females, thus this research aimed to obtain unbiased data so that both genders can be represented.

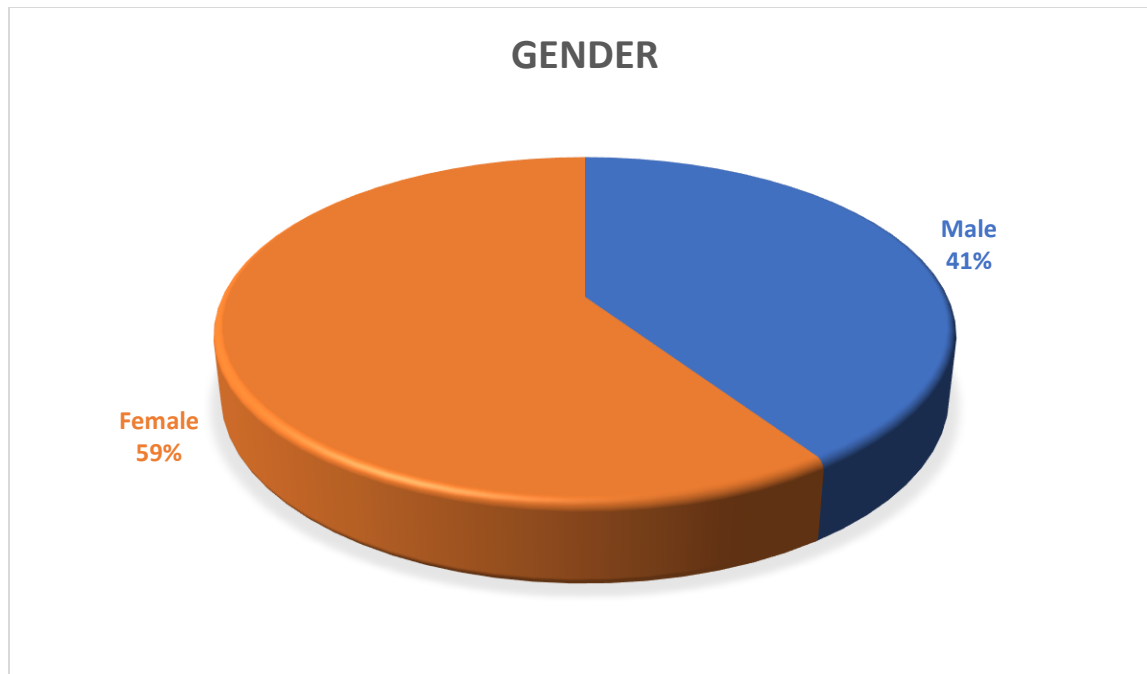


Fig 4. 1 Response rate according to gender

From **Fig 4.1** above it can be denoted that both genders were fairly represented as 13 out of 32 respondents were males making 41% and 19 out of 32 respondents were females making 59%.

Job Position

The researcher used stratified random sampling to distribute questionnaires and the researcher used job position as a stratum. The researcher used this method so as to get diverse views from different levels, as different positions use or apply data analytics differently, thus they might see different effects of data analytics.

Table 4. 3 Job position

Position	Number of respondents	Percentage
Audit Partners	0	0%
Audit Managers	6	18.75%
Audit Supervisors	6	18.75%
Audit Seniors	10	31.25%
Audit Juniors	10	31.25%
Total	32	100%

Table 4.3 shows that there was fair representation on each position with the exception of partnership level which had 0% response rate. According to Gray (2014), response rate shown in Table 4.3 can be concluded that effective, reliable, diverse and unbiased data was obtained as Gray (2014) states that using stratified random sampling might be difficult, but it yields more effective results. In addition, Pandey and Pandey (2015) also state that if more than 75% of the strata responds then a conclusion can be reached, that results obtained were effective. In this study, 80% of the strata responded, that is 4 different groups/job positions out of 5 responded.

Professional Qualifications

The questionnaire distributed had a part for professional qualifications, and this question was designed to ascertain that data which was collected was obtained from people qualified for the audit profession. Fig 4.2 shows the professional qualifications of the respondents.

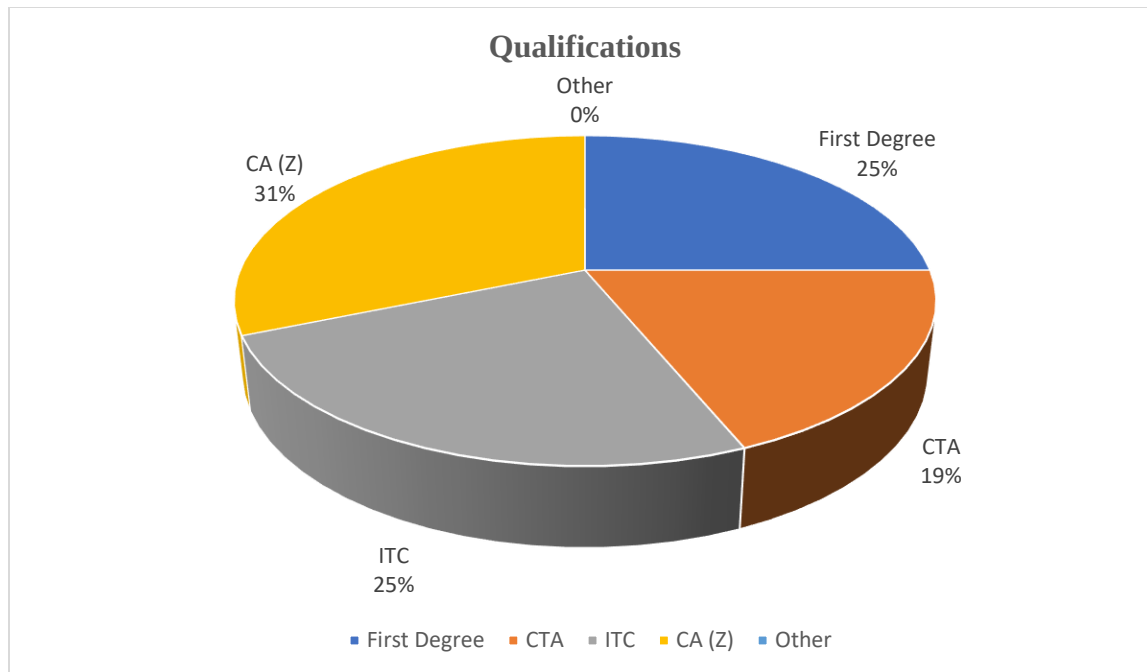


Fig 4. 2 Qualifications for Respondents

Fig 4.2 above delineates that data obtained was collected from knowledgeable people as shown by their qualifications, this implies that results obtained from the questionnaire were reliable and effective.

Working Experience

The question was designed to determine the number of years which the respondents have been in the field as this assisted on the reliability and richness of responses obtained. Schmdit (2014), states that number of years in a particular field by respondents, has an impact on the quality of responses obtained during a research. Table 4.4 below outlines the working experience of the respondents.

Table 4. 4 Working experience

Number of years in audit	Number of respondents	Percentage
0 - 3 years	10	31.25%
4 - 7 years	14	43.75%
7- 10 years	5	15.63%
Above 10 years	3	9.37%
Total	32	100%

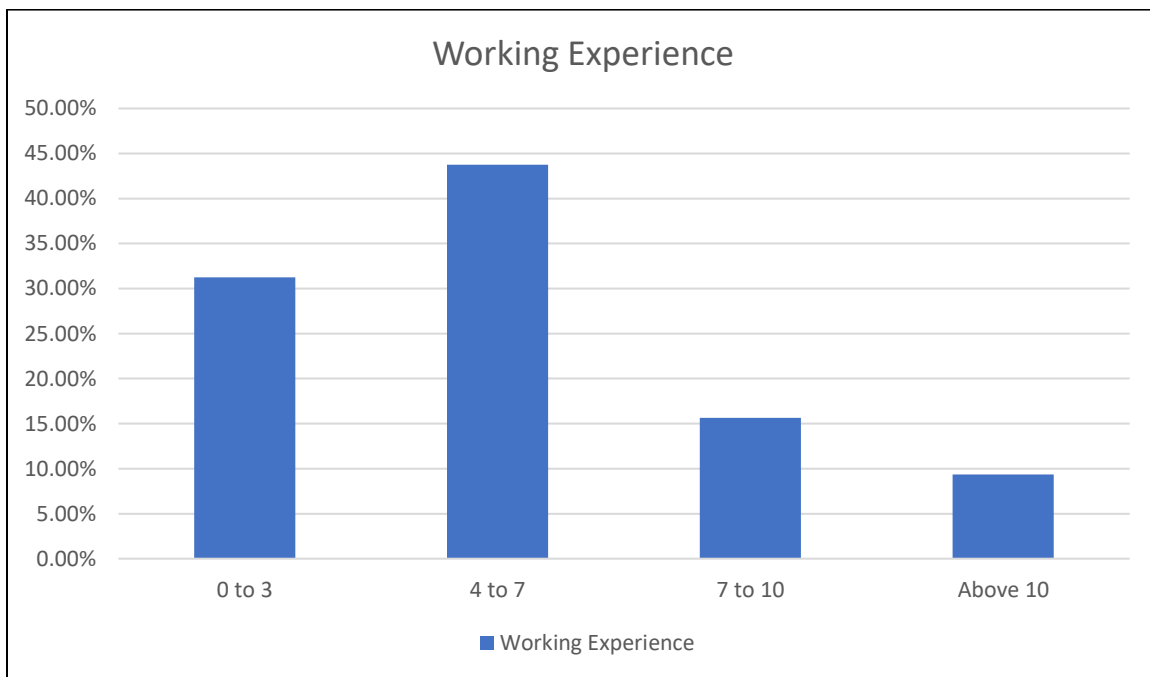


Fig 4. 3 Working Experience

From Table 4.4 and Fig 4.3 above it can be denoted that many respondents were in the range of 4 to 7 years of working experience which constituted 43.75% of the respondents, thus it can be concluded that data obtained was rich in detail.

4.3: DISCUSSION AND INTERPRETATION

Variables of audit efficiency

1) Time spent on the audit

The statement on the questionnaire meant to clearly find out if time spent on an audit is a variable of audit efficiency. Results obtained from the findings are shown below.

Table 4. 5 Time spent on an audit.

Audit Efficiency Variable	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Time spent on audit	0	0	3	10	19	32
Response Percentage	0%	0%	9.38%	31.25%	59.37%	100%

Table 4.5 shows that 0/32 (0%) strongly disagree, 0/32 (0%) disagree, 3/32 (9.38%) are neutral, 10/32 (31.25%) agree and 19/32 (59.37%) strongly agree that time spent on an audit is a variable of audit efficiency. In total, 0/32 (0%) disagree, 3/32 (9.38%) are neutral and 29/32 (90.62%) agrees that time spent on an audit is a variable of audit efficiency.

The researcher concluded that time spent on an audit is a variable of audit efficiency based on the results shown above. This is also supported by Bender (2017) who states that hours spent to finish an audit task is a variable of audit efficiency. In addition, Fedaa (2017) and Mack (2016) also supports that time spent auditing is a variable of audit efficiency.

2) Costs of an audit

The statement on the questionnaire aimed at determining if costs of an audit is a variable of audit efficiency. Results obtained from questionnaires which were responded is shown below.

Table 4. 6 Costs of an audit

Audit Efficiency Variable	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Costs of an audit	0	2	4	14	12	32
Response Percentage	0%	6.25%	12.5%	43.75%	37.5%	100%

Table 4.6 above highlights that 0/32 (0%) strongly disagree, 2/32 (6.25%) disagree, 4/32 (12.5%) are neutral, 14/32 (43.75%) agree and 12/32 (37.5%) strongly agree that costs of an audit is a variable of audit efficiency. In total, 2/32 (6.25%) disagree, 4/32 (12.5%) are neutral and 26/32 (81.25%) agrees that costs of an audit is a variable of audit efficiency.

From the results obtained above it can be deduced that costs of an audit are a variable of audit efficiency as many respondents suggested that costs of an audit are a variable. Earley (2015) and Bender (2017) supports the fact shown by the results that costs of an audit is a variable of audit efficiency.

3) Audit fee

The statement on the questionnaire purported to seek clarity on whether audit fee is a variable of audit efficiency. Respondents expressed their opinions and results obtained are shown in the table below.

Table 4. 7 Audit fee

Audit Efficiency Variable	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Audit fee	11	6	9	4	2	32
Response Percentage	34.38%	18.75%	28.13%	12.5%	6.25%	100%

As shown in table 4.7, 11/32 (34.38%) strongly disagree, 6/32 (18.75%) disagree, 9/32 (28.13%) are neutral, 4/32 (12.5%) agree and 2/32 (6.25%) strongly agree that audit fee is a variable of audit efficiency. In aggregate, 17/32 (53.13%) disagrees, 9/32 (28.13%) are neutral and 6/32 (18.75%) agrees that audit fee is a variable of audit efficiency.

Using the mode, the researcher deduced that audit fee is not a variable for audit efficiency because 17 out of 32 respondents highlights that audit fee is not a variable whilst only 6 respondents agreed that it is a variable for audit efficiency. This is supported by Hosseinniakani (2014) who highlighted that audit fee cannot be determined as a major variable of audit efficiency. Earley (2015) also supported the fact that audit fee is not a variable of audit efficiency. However, results obtained contradicted with Bender (2017) who highlighted that audit fee is one of the variables of audit efficiency.

Impact of data analytics on audit efficiency

This question was designed to get insightful different views on the impact of data analytics on audit efficiency which assisted the researcher in coming up with the results of the main objective of this study. The table below shows responses which were obtained from the questionnaires which were responded.

Table 4. 8 Impact of Data Analytics on Audit Efficiency.

	Positive Impact	Negative Impact	No Impact	Total
Impact of Data Analytics on Audit efficiency	21	5	6	32
Response Percentage	65.63%	15.62%	18.75%	100%

The table 4.8 above demonstrates that 21/32 (65.63%) alluded that data analytics have a positive impact on audit efficiency, 5/32 (15.62%) highlighted that data analytics have a negative impact on audit efficiency and lastly 6/32 (18.75%) alluded that data analytics do not have an impact on audit efficiency.

Fig 4. 4 Impact of Data Analytics on Audit Efficiency

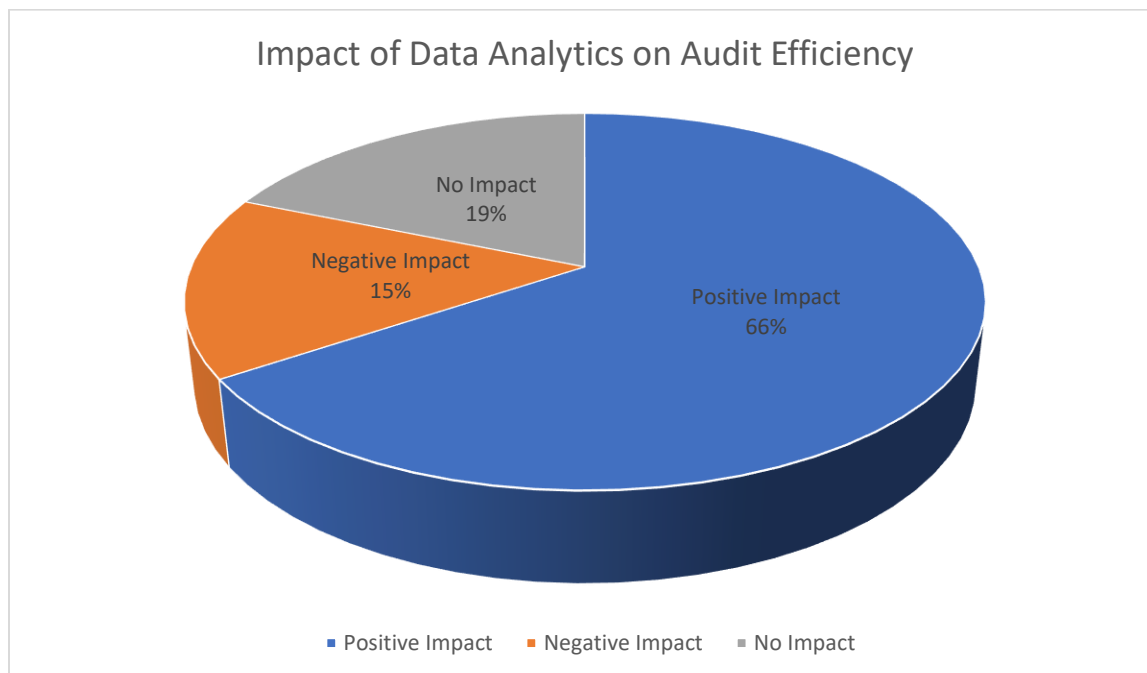


Fig 4.4 shows that many respondents highlighted that data analytics have a positive impact on audit efficiency and it can be concluded that data analytics do impact audit efficiency in a positive way. Alles (2015) and Gepp et al. (2018) support the fact shown by the results above that “there is a positive impact on audit efficiency”, as Alles (2015) alluded that audit firms should keep on investing in data analytics as they have a positive impact on audit efficiency. Furthermore, Chan et al. (2018) also support results obtained above as Chan et al, (2018) state that automation and use of technology in carrying out audit assignments enhances audit efficiency. However, a research by Bender (2017) contradicts the findings above as Bender (2017) highlighted that data analytics do not have an impact on audit efficiency thus the 19% which highlighted that there is no impact might be justified. Taking into consideration the findings which were obtained and arguments by scholars the researcher deduced that data analytics have a positive impact on audit efficiency.

Full implementation of data analytics by the firm

The main aim of this question was to assess if the firm (KPMG) needs to fully implement data analytics in audit processes and *this assisted the researcher in coming up with recommendations.*

The results are tabulated below.

Table 4. 9 Implementation of Data Analytics

	Yes		No	Total
The firm needs to fully implement data analytics	27		5	32
Response Percentage	84%		16%	100%

Table 4.9 shows that 27/32 (84%) alluded that the firm should fully implement data analytics whilst 5/32 (16%) highlighted that the firm should not fully implement data analytics.

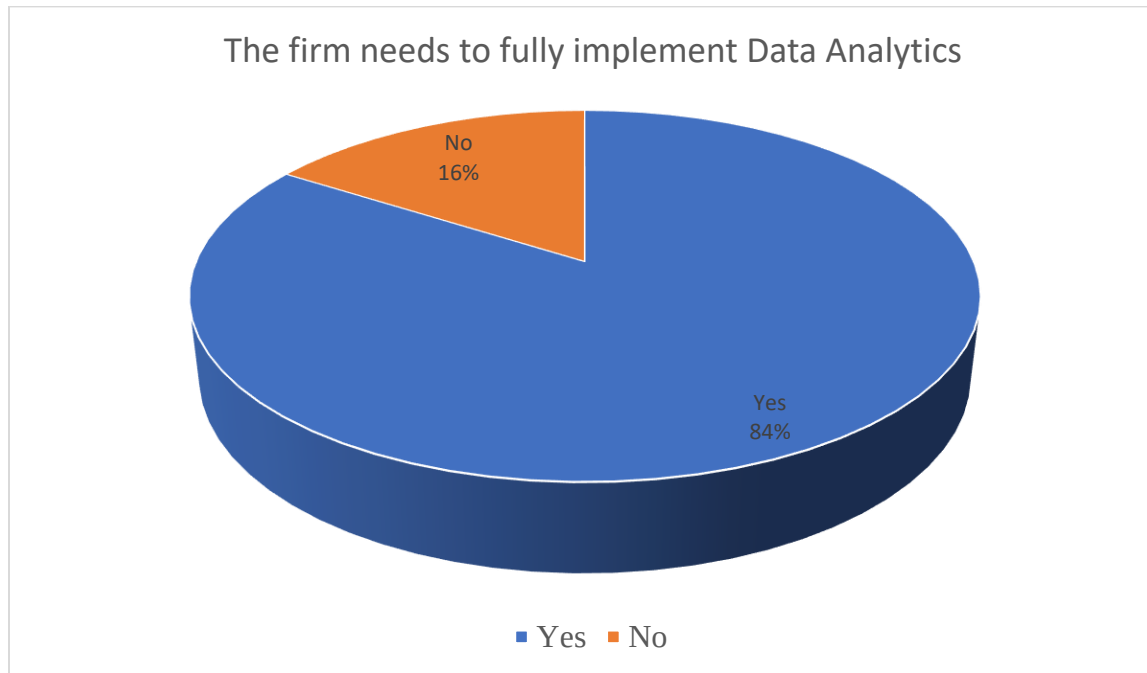


Fig 4. 5 Implementation of Data Analytics by the firm

Fig 4.5 above illustrates that 84% of the respondents highlighted that the firm (KPMG) needs to fully implement Data Analytics. The results obtained above can be supported by Ramlukan (2015) who highlighted that audit firms need to continuously invest in data analytics so that they can fully implement data analytics in all audit processes. In addition, EY (2015) and Harris (2017) also supports the fact that the firm needs to fully implement data analytics as they state that clients are now producing big data which needs the firm to fully implement data analytics in order to make auditing easy for auditors. The research by Gepp et al, (2018) concluded that audit firms need to fully implement data analytics so as to catch up with transformation of data into big data, thus supporting the findings highlighted table 4.9 and fig 4.5.

Importance of data analytics in auditing

This section was purported to explore the importance of data analytics in auditing, by accessing views from different individuals in the external audit department.

1) Improves audit efficiency

The statement intended to find out if one of the benefits of application of data analytics is enhancement of audit efficiency. Findings obtained are indicated in the table below.

Table 4. 10 Improves audit efficiency

Importance of Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Improves audit efficiency	0	0	2	6	24	32
Response Percentage	0%	0%	6%	19%	75%	100%

Table 4.10 above exhibit that 0/32 (0%) strongly disagree, 0/32 (0%) disagree, 2/32 (6%) are neutral, 6/32 (19%) agree and 24/ 32 (75%) strongly agree that data analytics improves audit efficiency. In total, 0/32 (0%) disagree, 2/32 (6%) are neutral and 30/32 (94%) agreed data audit analytics improves audit efficiency.

Taking into consideration the mode statistical analysis it can be deduced that data analytics improves audit efficiency as many respondents above do agree to that. This is supported by Chao et al, (2018) who highlighted that data analytics will accelerates the audit processes to be taken if fully implemented by audit firms. Byrnes et al, (2014) also support the results obtained above as they alluded that audits will become more efficient with the help of data analytics.

2) Improves audit effectiveness

The statement was designed to determine if data analytics improves audit effectiveness. Table below illustrates the findings which were gathered.

Table 4. 11 Improves audit effectiveness.

Importance of Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Improves audit effectiveness	0	1	3	10	18	32
Response Percentage	0%	3.13%	9.37%	31.2%	56.25%	100%

Table 4.11 conveys that 0/32 (0%) strongly disagree, 1/32 (3.13%) disagree, 3/32 (9.37%) are neutral, 10/32 (31.25%) agree and 18/32 (56.25%) strongly agree that data analytics improves audit effectiveness.

Combined 1/32 (3.13%) disagree, 3/32 (9.37%) neutral and 28/32 (87.5%) agrees that data analytics improves audit effectiveness.

It can be seen from results above that many respondents agreed that data analytics improves audit effectiveness thus the researcher concluded that data analytics improves audit efficiency. CFRR (2017) supports the above results as their research highlighted that data analytics increases the effectiveness of an audit. Agerberg (2017) also supports the fact that data analytics improves audit effectiveness as illustrated with the results above as Agerberg (2017) states that data analytics improves effectiveness of auditing.

3) Improves client service

The statement of the questionnaire seeks for clarity on whether data analytics improves client service or not. The responses from the questionnaire are tabulated below.

Table 4. 12 Improved client service

Importance of Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Improved client service	2	4	6	15	5	32
Response Percentage	6%	13%	19%	47%	16%	100%

The table above reveals that 2/32 (6.25%) strongly disagree, 4/32 (12.5%) disagree, 6/32 (18.75%) are neutral, 15/32 (46.88%) agree and 5/32 (15.62%) strongly agree that there is improved client service when data analytics are applied in auditing.

In total 6/32 (18.75%) disagree, 6/32 (18.75%) are neutral and 20/32 (62.5%) agrees that data analytics improves client service.

The results which were obtained illustrates that many respondents agreed that use of data analytics improves client service. This is supported by IAASB (2016) study which states that “there is a development of stakeholder expectations regarding the use of technology in auditing”. However, the response which was given by other respondents who disagreed can also be supported by Earley (2015) who argues that data analytics do not provide clients with competitive and innovative insights.

4) Enhances audit quality

The main reason for this statement was to assess if data analytics improves audit quality. Table below presents results which were obtained from the questionnaires which were distributed.

Table 4. 13 Enhances audit quality.

Importance of Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Enhances audit quality	0	1	2	8	21	32
Response Percentage	0%	3%	6%	25%	66%	100%

It can be seen from table 4.13 above that 0/32 (0%) strongly disagree, 1/32 (3.12%) disagree, 2/32 (6.25%) are neutral, 8/32 (25%) agree and 21/32 (65.63%) strongly agree that application of data analytics in audit enhances audit quality. In summation, 1/32 (3.12%) disagree, 2/32 (6.25%) are neutral and 29/32 (90.62%) agree that data analytics enhances audit efficiency.

Basing on mode statistics it can be deduced that data analytics enhances audit quality as many respondents fall under the modal class of agreeing. In support of the results obtained above Wang (2015) highlighted that data analytics plays a pivotal role in improving audit quality. A research by Liddy (2015) also supports the results obtained above as the research states that data analytics improves risk assessment which is known as one of the key elements of audit quality. In addition, DeBonhome (2017) also supports the fact that data analytics improves audit quality as shown by the results as DeBonhome (2017) alluded that audit quality can be improved if data analytical tools are used to obtain audit evidence.

However, part of the respondents which disagreed even if they are very few can be justified since Albeit (2014) states that it is difficult to define audit quality, as what is presumed to be quality by one person might not be quality to a different person.

5) Closes the expectation gap

The statement of the questionnaire meant to assess if one of the benefits of data analytics is to close the expectation gap in auditing. Table below displays the results which were obtained from the questionnaires which were distributed.

Table 4. 14 Closes the expectation gap

Importance of Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Closes the expectation gap	4	6	3	11	8	32
Response Percentage	12.5%	18.75%	9.37%	34.38%	25%	100%

Table 4.14 above conveys that 4/32 (12.5%) strongly disagree, 6/32 (18.75%) disagree, 3/32 (9.37%) are neutral, 11/32 (34.38%) agree and 8/32 (25%) strongly agree that data analytics assist in closing the expectation gap between the auditors and client. In total, 10/32 (31.25%) disagree, 3/32 (9.37%) are neutral and lastly, 19/32 (59.38%) agrees that application of data analytics closes the expectation gap.

By making use of mode statistics analysis the researcher deduced that data analytics closes the expectation gap because many respondents agreed that data analytics closes the expectation gap. Alles (2015) supports the results obtained above that data analytics closes the expectation gap as Alles (2015) states that data analytics can be used to improve fraud detection due to more available

data computerized tools. In support of the results obtained above, Earley (2015) states that “the most common expectation gap of fraud detection can be reduced if data analytics are fully implemented by auditors in their processes”. The results above also show that 10/32 respondents disagreed and this can be justified because (ISA 240) indicates that it is not the responsibility of an auditor to detect fraud which is one of the main expectation gaps.

However, it shows that some of the auditors are not aware of ISA 240 (Redrafted) which states that the primary responsibility for fraud detection rests with those charged with governance but auditors are also responsible through issuing a reasonable assurance.

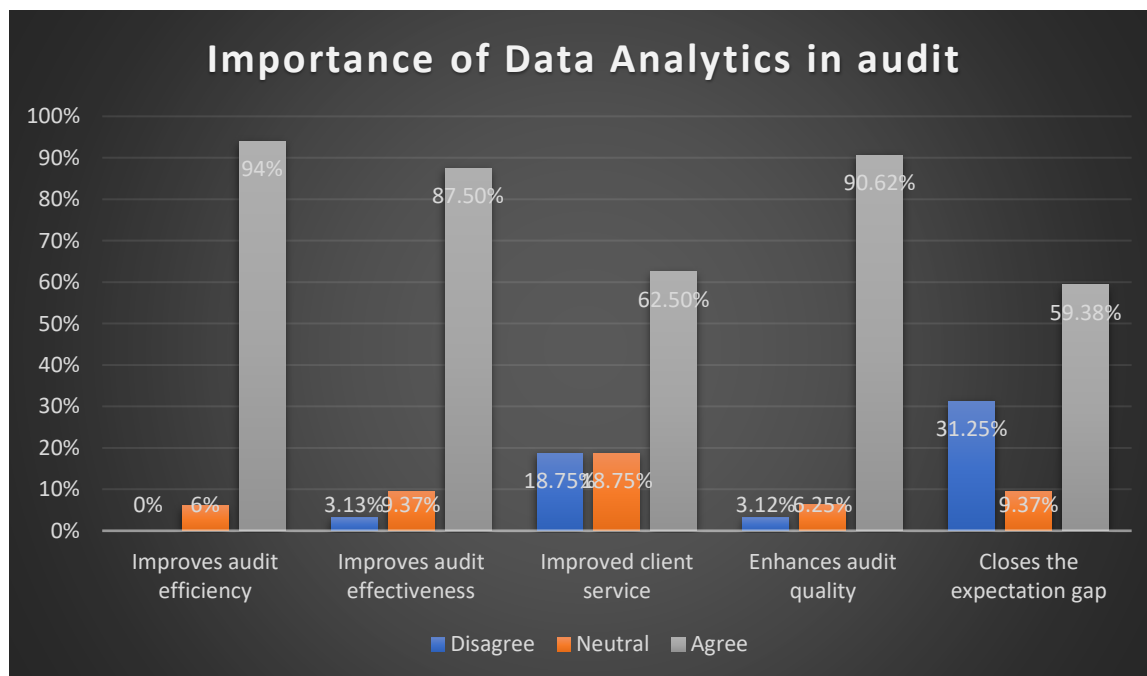


Fig 4. 6 Importance of Data Analytics in audit

In aggregate Fig 4.6 above reveals the importance of data analytics and it can be noted that many respondents were agreeing with the importance of data analytics. However, even if many respondents were agreeing with the importance of data analytics, Fig 4.6 above shows that many respondents agreed that data analytics improves audit efficiency as it is the one which had highest

number of respondents who agreed. In other words, respondents highlighted that enhancement of audit efficiency is the main advantage of data analytics. This is supported by Appelbaum et al, (2015) who highlighted that the main reason why audit firms should implement data analytics is that application of data analytics accelerates all audit processes to be taken. Taking into consideration responses from the respondents and arguments by other scholars the researcher concluded that the main advantage of data analytics is that they improve audit efficiency.

Challenges encountered when using data analytics

This question on the questionnaire was designed to assess the challenges faced by auditors when using data analytics, and the challenges are as follows.

1)Expertise of auditors

The question aims to determine if expertise of auditors is really a challenge faced when using data analytics. The findings from distributed questionnaires is highlighted below.

Table 4. 15 Expertise of auditors

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Expertise of auditors	1	3	7	4	17	32
Response Percentage	3.13%	9.37%	21.87%	12.5%	53.13%	100%

Table 4.15 above outlines that 1/32 (3.13%) strongly disagree, 3/32 (9.37%) disagree, 7/32 (21.87%) are neutral. 4/32 (12.5%) agree and 17/32 (53.13%) strongly agree that one of the challenges encountered when using data analytics is that auditors lack the required expertise. In

total, 4/32 (12.5%) disagree, 7/32 (21.87%) are neutral and 21/32 (65.63%) agree that lack of required expertise is one of the challenges encountered when using data analytics.

The researcher used the mode to conclude that expertise of auditors is one of the challenges encountered when using data analytics. This is because many respondents were in the modal class which agreed that expertise of auditors is a challenge faced when using data analytics. Research by Earley (2015) supports the above results as the research states that auditors are lagging behind when it comes to use of data analytics because they do not have the required skills to apply data analytics. ICAS (2017) also supports the results obtained above as their research states that the main challenge faced by auditors in using data analytics is that they lack the right skills which enables them to use data analytics.

2)Data availability, integrity and relevance

This question was structured to verify if data availability, integrity and relevance is one of the challenges encountered by auditors when using data analytics. The results which were obtained from the questionnaires which were distributed are shown in Table 4.18

Table 4. 16 Data Availability, Integrity and Relevance

Challenges encountered when using Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Data Availability, Integrity and Relevance	0	3	1	7	21	32
Response Percentage	0%	9.37%	3.13%	21.88%	65.62%	100%

It is visible from table 4.16 that 0/32 (0%) strongly disagree, 3/32 (9.37%) disagree, 1/32 (3.31%) are neutral, 7/32 (21.88%) agree and 21/32 (65.62%) strongly agree that data availability, integrity

and relevance is another challenge encountered when using data analytics. Combined, 3/32 (9.37%) disagree, 1/32 (3.13%) neutral and 28/32 (87.5%) agree that data availability, integrity and relevance is one of the challenges encountered when using data analytics.

The results above render that many respondents agreed that data availability, integrity and relevance is one of the challenges encountered. This is because auditors are restricted access to data and there are chances that the client will temper around that data thus reducing its relevance as that data will lack integrity. Debreceeny and Gray (2014) support the results which were obtained as they states that restriction access to client`s data is a major barrier which shadows the importance of data analytics. Taking into consideration the results which were obtained through questionnaires and scholars` arguments the researcher deduced that data availability, integrity and relevance is a challenge encountered when using data analytics.

3)Theft of data

The question was designed to verify if theft of data is one of the challenges encountered when using data analytics. Table below presents results which were obtained.

Table 4. 17 Theft of data

Challenges encountered when using Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Theft of data	4	5	2	14	7	32
Response Percentage	12.5%	15.63%	6.25%	43.75%	21.87%	100%

Table 4.17 highlights that 4/32 (12.5%) strongly disagree, 5/32 (15.63%) disagree, 2/32 (6.25%) are neutral, 14/32 (43.75%) agree and 7/32 (21.87%) strongly agree. In total, 9/32 (28.13%) disagree, 2/32 (6.25%) are neutral and 21/32 (65.62%) agree that theft of data is one of the challenges encountered when using data analytics.

The results obtained show that many respondents agreed that theft of data is one of the challenges encountered when using data analytics, this is because when using applications and software there might be chances of hackers. Laura (2018) supports the above results as Laura (2018) highlighted that use of data analytical tools makes client's data prone to hackers and the blame might be put on auditors which will affect the firm-client relationship. A research by Kumar (2017) also supports the above findings as the research states that unauthorized users might access client's data thus confidential information might be published.

4)System break down

The question intended to assess if system breakdown is a challenge encountered when using data analytics. Findings gathered are shown in the table below.

Table 4. 18 System breakdown

Challenges encountered when using Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
System breakdown	0	3	3	10	16	32
Response Percentage	0%	9.37%	9.37%	31.25%	50%	100%

Table 4.18 conveys that 0/32 (0%) strongly disagree, 3/32 (9.37%) disagree, 3/32 (9.37%) are neutral, 10/32 (31.25%) agree and 16/32 (50%) strongly agree that when using data analytics system breakdown might be a challenge. In aggregate 3/32 (9.37%) disagree, 3/32 (9.37%) are

neutral and 26/32 (81.25%) agree that system breakdown is a challenge encountered when using data analytics.

From the results above it can be deduced that many respondents agreed that system breakdown is really a challenge when using data analytics. This is supported by Adrain (2017) who highlighted that system breakdown is one of the major challenges encountered when using data analytics as this might decrease audit efficiency since auditors might not be able to fix some breakdowns. Brown-Liburd et al, (2015) also support the above results as they state that when there is system breakdown some data might be lost and auditors have to wait until the specialists fix the problem this might cause auditors to spend more time at engagements thus affecting audit efficiency negatively.

5)Compatibility of hardware

The question was designed to evaluate if compatibility of hardware is a challenge encountered when using data analytics. Findings obtained from questionnaires which were distributed are shown in the table below.

Table 4. 19 Compatibility of hardware

Challenges encountered when using Data Analytics	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Compatibility of hardware	7	6	1	18	0	32
Response Percentage	21.87%	18.75%	3.13%	56.25%	0%	100%

Table 4.19 above delineate that 7/32 (21.87%) strongly disagree, 6/32 (18.75%) disagree, 1/32 (3.13%) neutral, 18/32 (56.25%) agree and 0/32 (0%) strongly agree that compatibility of hardware is a challenge encountered when using data analytics. In total, 13/32 (40.62%) disagree, 1/32

(3.13%) and 18/32 (56.25%) agree that compatibility of hardware is a challenge encountered when using data analytics.

From the findings above it can be noted that, many respondents fall under the modal class of agreeing that compatibility of hardware is a challenge encountered when using data analytics. The results above which states that compatibility of hardware is a challenge are supported by a research which was done by Mansour (2016), which indicated that some computers which are used by auditors are not compatible with data analytical tools as some computers might crash or slow down during audit thus affecting audit efficiency. In support of the above results Alles (2015) also indicate that some data analytical tools are not compatible with client's hardware and this might affect the client's hardware and all the blame will be put on auditors. Taking into consideration the results which were obtained from questionnaires and arguments by scholars it can be deduced that compatibility of hardware is a challenge encountered when using data analytics.

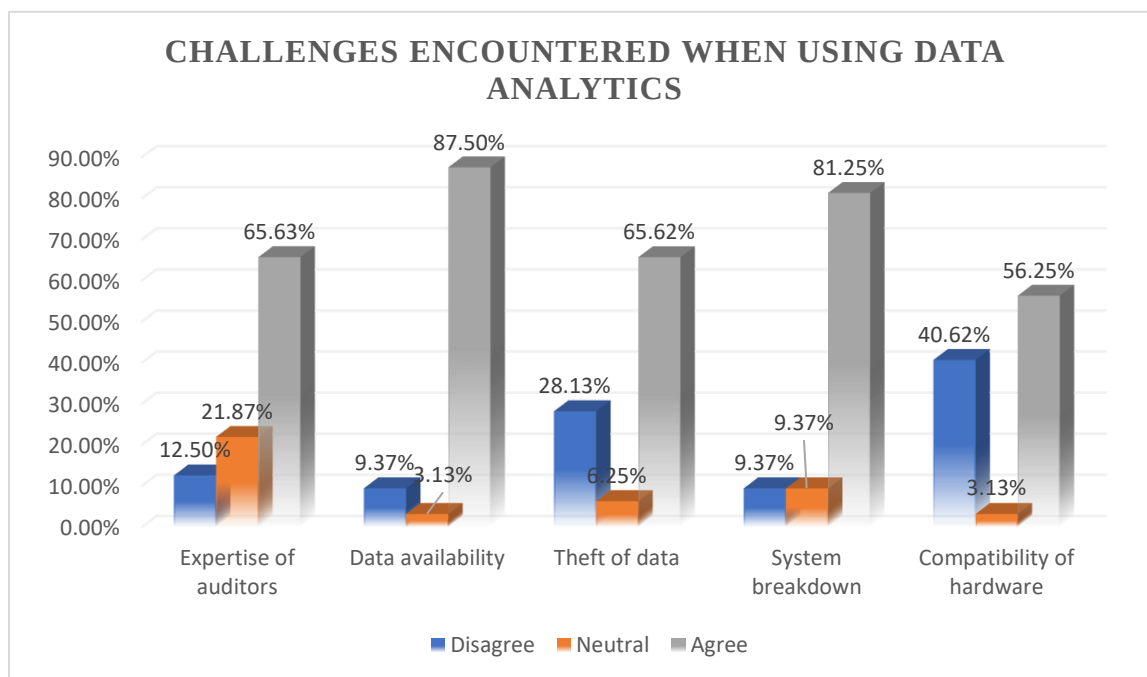


Fig 4. 7 Challenges encountered when using Data Analytics

In aggregate fig 4.7 above delineates responses which were given in respect with challenges encountered when using data analytics. It can be noted from fig 4.8 that many respondents were in the modal class which was agreeing to the challenges encountered, this made the researcher to deduce that data availability, integrity and relevance, system breakdown are the main challenges encountered when using data analytics as they have the highest number of respondents who agreed. This is supported by Adrain (2017) and Laura (2018) who highlighted in their researches that data availability, integrity, relevance and system breakdown are the major challenges encountered when using data analytics because they decrease audit efficiency.

Solutions to the challenges faced when using data analytics

The statement on **the questionnaire** was designed to verify the solutions to address the challenges encountered when using data analytics.

1) Training and education knowledge for auditors

This statement was meant to assess if training and education knowledge is one of the solutions to address the challenges faced when using data analytics. Table below unfolds the findings which were obtained.

Table 4. 20 Training and Education knowledge for auditors

Solutions to challenges faced	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Training and education knowledge for auditors	0	0	1	5	26	32
Response Percentage	0%	0%	3.13%	15.62%	81.25%	100%

As shown in table 4.20 above 0/32 strongly disagree, 0/32 disagree, 1/32 (3.13%) neutral, 5/32 (15.62%) agree and 26/32 (81.25%) strongly agree that training and education knowledge for auditors is a solution for challenges encountered when using data analytics. In summation 0/32 (0%) disagree, 1/32 (3.13%) neutral and 31/32 (96.87%) agree.

Using mode, it can be denoted that many respondents agreed that training and education knowledge for auditors is a solution to the challenges encountered. This is because training and education improves auditors' expertise thus addressing one of the challenges encountered when using data analytics which is lack of expertise. Alexander and Gentry (2015) supports the results obtained above as they state that audit firms must encourage universities to educate students about data analytics so that when they recruit them they will only focus on the practical part. In addition, Earley (2015) also supports the above results as Earley (2015) suggests that audit firms must train their auditors and educate them on data analytics so that they can improve on their skills. Considering the results which were obtained from questionnaires and arguments by scholars the researcher deduced that training and education knowledge is a solution to challenges encountered when using data analytics.

2)Auditors' access to data

The statement was meant to determine if auditors' access to data is a solution to challenges encountered when using data analytics. Table below indicates the results which were obtained.

Table 4. 21 Auditors access to data

Solutions to challenges faced	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Auditors` access to data	4	1	6	9	12	32
Response Percentage	12.5%	3.13%	18.75%	28.12%	37.5%	100%

The table above shows that 4/32 (12.5%) strongly disagree, 1/32 (3.13%) disagree, 6/32 (18.75%) are neutral, 9/32 (28.12%) agree and 12/32 (37.5%) strongly agree that auditors' access to data is one of the solutions to challenges encountered when using data analytics. Combined 5/32 (15.63%) disagree, 6/32 (18.75%) are neutral and 21/32 (65.62%) agree.

The results shown above depicts that many respondents agreed that auditors' access to data is a solution to challenges faced when using data analytics. This is supported by Bender (2017) who highlighted that auditors consider extraction of data the biggest challenge encountered when using data analytics and this can be solved if auditors are allowed to extract data on their own and granted access to all data without the interference of the client. Considering the results obtained from the questionnaires which were distributed and arguments by other scholars the researcher deduced that auditors' access to data is a solution to challenges faced when using data analytics.

3)Back up

The statement was planned to verify if back up for data or information, can be classified as a solution to challenges faced when using data analytics. Table 4.22 presents data which was obtained from questionnaires which were distributed.

Table 4. 22 Back up

Solutions to challenges faced	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Back up	0	4	0	20	8	32
Response Percentage	0%	12.5%	0%	62.5%	25%	100%

Table 4.22 above outlines that 0/32 (0%) strongly disagree, 4/32 (12.5%) disagree, 0/32 (0%) neutral. 20/32 (62.5%) agree and 8/32 (25%) strongly agree that back up is one of the solutions to challenges encountered when using data analytics. Comprehensively, 4/32 (12.5%) disagree whilst 28/32 (87.5%) agree that back up is a solution to challenges encountered when using data analytics.

It can be concluded that back up is a solution to challenges faced when using data analytics this is because many respondents fall under the modal class of agreeing. The results obtained above are also supported by Kumar (2017) who highlighted that auditors must have back up plans in place in case of system breakdown so that audit work will not stop due to system breakdown.

4) Data encryption

The statement intended to assess if data encryption is one of the solutions to challenges faced when using data analytics. Findings are tabulated in table 4.23 below.

Table 4. 23 Data encryption

Solutions to challenges faced	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Data encryption	0	10	2	18	2	32
Response Percentage	0%	31.25%	6.25%	56.25%	6.25%	100%

It can be seen in table 4.23 that 0/32 (0%) strongly disagree, 10/32 (31.25%) disagree, 2/32 (6.25%) are neutral, 18/32 (56.25%) agree and 2/32 (6.25%) strongly agree that data encryption is a solution to the challenges faced when using data analytics.

In total, 10/32 (31.25%) disagree, 2/32 (6.25%) are neutral and 20/32 (62.5%) agree.

It can be noted that data encryption is a solution to challenges encountered when using data analytics since many respondents fall under the modal class which was agreeing. This is because if data is encrypted chances of theft of data are reduced. This notion is supported by Mansour (2016) who states that auditors must encrypt their computers as they contain confidential data of clients. In addition, Alles (2015) also supports the results above as Alles (2015) alluded that access to system or software must have password and passwords must frequently be changed this mitigates the risk of theft of data. Taking into consideration results obtained from the questionnaires and arguments by different scholars the researcher deduced that data encryption is a solution to challenges encountered when using data analytics.

5)Recruitment of Information Technology Department

The statement was designed to verify if recruiting information technology department mitigates the challenges encountered when using data analytics. Table below highlights the results which were obtained.

Table 4. 24 Recruitment of Information Technology department

Solutions to challenges faced	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Recruitment of Information Technology Department	5	6	4	13	4	32
Response Percentage	15.63%	18.75%	12.5%	40.62%	12.5%	100%

Table above renders that 5/32 (15.63%) strongly disagree, 6/32 (18.75%) disagree, 4/32 (12.5%) are neutral, 13/32 (40.62%) agree and 4/32 (12.5%) strongly agree that recruiting information technology department mitigates challenges encountered when using data analytics. In total, 11/32 (34.37%) disagree, 4/32 (12.5%) are neutral and 17/32 (53.13%) agree.

Results shown in table 4.24 clearly demystify that many respondents agreed that recruiting information technology department is a solution to the challenges encountered when using data analytics. The results obtained and analyzed above are supported by Bieger (2015), who states that firms must have a department for information technology which will be assisting auditors to carry out their processes. In support of the above results Capriotti (2014) also states that a firm needs to have an Information Technology Audit department and Information Technology Systems department which will assist auditors in carrying out their procedures.

However, some of the respondents disagreed that recruiting information technology department is a solution to challenges faced when using data analytics because auditors fear that Information technology specialists will gradually take away jobs from them. This notion is supported by Hassan (2014) who states that recruitment of Information Technology department might not be taken as a good idea by auditors as they fear that they may lose their jobs. Taking into consideration the results obtained from questionnaires and arguments by other scholars the researcher concluded that recruiting an information technology department is a solution to challenges faced when using data analytics.

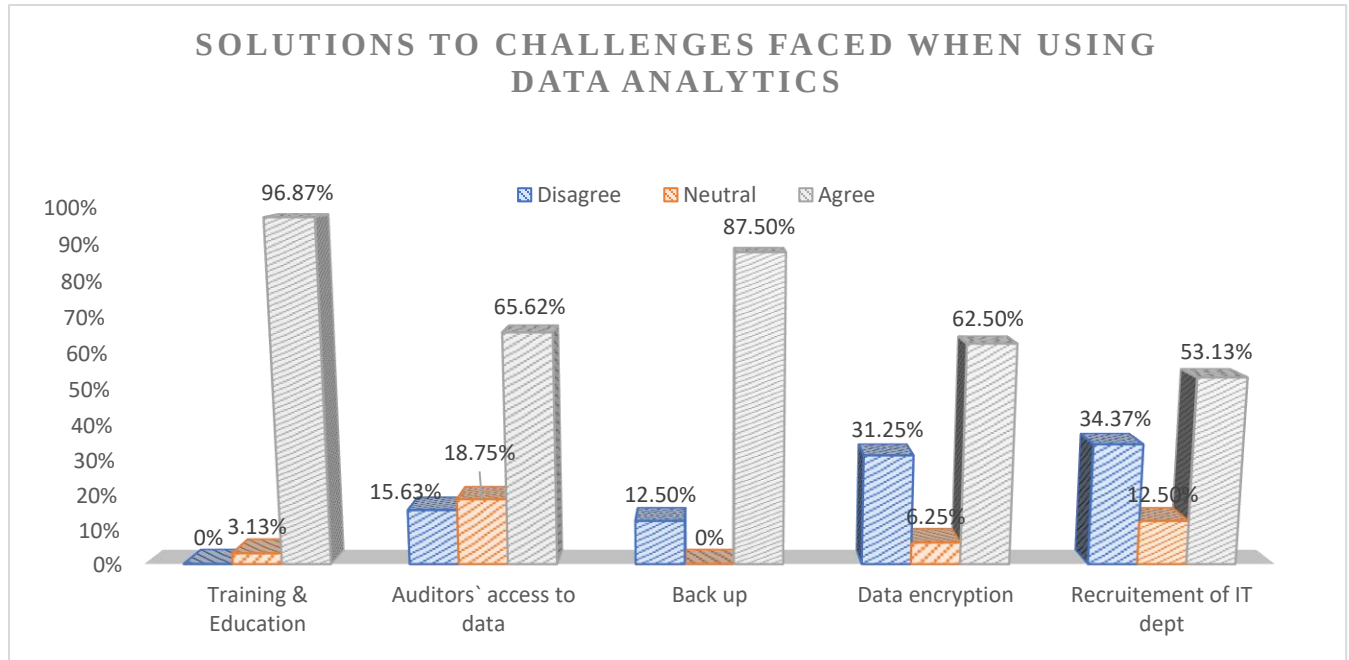


Fig 4.8

Fig 4.8 illustrates that many respondents were agreeing that training and education of auditors, back up, data encryption, auditors' access to data, and recruitment of information technology department are solutions to the challenges encountered when using data analytics. It can also be noted that training and education of auditors can be denoted as the main solution to challenges encountered when using data analytics as it has the highest number of respondents who agreed. This is supported by Earley (2015) who states that “the major solution to address challenges encountered when using data analytics is to educate and train auditors”. From the results obtained from questionnaires and suggestions by other scholars the researcher deduced that training of auditors, auditors' access to data, back up, data encryption and recruitment of information technology department are solutions to the challenges faced.

Data analytical tools that can be implemented

The question was designed to assess other Data Analytical tools that the firm can implement which will assist to improve audit efficiency, and they are as follows.

Embedded Audit Routines

This question was meant to verify if systems control audit review function, Integrated Test Facility and Snapshots can be implemented by the firm. The table below illustrates results which were obtained.

Table 4. 25 Embedded Audit Routines

Embedded Audit Routines	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Systems Control Audit Review Function	0	0%	4	12.50%	4	12.50%	15	46.87%	9	28.13%
Integrated Test Facility	6	18.75%	8	25%	3	9.37%	10	31.25%	5	15.63%
Snapshots	0	0%	7	21.87%	15	46.88%	10	31.255	0	0%

1)Systems Control Audit Review Function

The table 4.25 above shows that 0/32 (0%) strongly disagree, 4/32 (12.5%) disagree, 4/32 (12.5%) are neutral, 15/32 (46.87%) agree and 9/32 (28.13%) strongly agree that the firm need to

implement systems control audit review function. In total, 4/32 (12.5%) disagree, 4/32 (12.5%) are neutral and 24/32 (75%) agree.

From the results shown above it can be noted that many respondents fall in the modal class which was agreeing, thus the researcher deduced that the firm needs to implement systems control audit review function. This notion is also supported by Jackson and Stent (2014) who state that “with systems control audit review function the whole period under review is covered and this might improve audit efficiency”.

2)Integrated Test Facility

Table 4.25(below), illustrates that 6/32 (18.75%) strongly disagree, 8/32 (25%) disagree, 3/32 (9.37%) are neutral, 10/32 (31.25%) agree and 5/32 (15.63%) strongly agree that Integrated test facility is another data analytical tool that the firm can implement. In total, 14/32 (43.75%) disagree, 3/32 (9.37%) are neutral and 15/32 (46.87%) agree

From analysis of the above results using mode it can be said that the firm needs to implement integrated test facility since it has many respondents. However, it is controversial since the difference between respondents who agree and disagree is just one. In addition, 3 respondents were neutral which implies that it might not be a good idea for the firm to implement integrated test facility. This is because many auditors think that the tool is similar for testing data hence there is no need to implement it. Mansour (2016) contradicts with the results obtained and analyzed above since Mansour (2016) states that even if integrated test facility is almost similar to test data, integrated test facility is more efficient and effective.

3)Snapshots

Table 4. 26

Embedded Audit Routines	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
Systems Control Audit Review Function	0	0%	4	12.50%	4	12.50%	15	46.87%	9	28.13%
Integrated Test Facility	6	18.75%	8	25%	3	9.37%	10	31.25%	5	15.63%
Snapshots	0	0%	7	21.87%	15	46.88%	10	31.255	0	0%

Table 4.25 renders that 0/32 (0%) strongly disagree, 15/32 (46.88%) are neutral and 10/32 (31.25%) agree that the firm needs to implement snapshots as another data analytical tool.

It can be noted that many respondents are neutral on whether the firm should implement snapshots, followed by respondents who agree that the firm should implement snapshots. The results obtained above are supported by Alles (2015) who highlighted that embedded audit routines are not efficient and effective as the client`s IT specialists can disable the modules inserted in client`s computers.

Program Code Analysis

The question was designed to assess if the firm needs to implement program code analysis as another data analytical tool. The table below presents findings which were obtained.

Table 4. 27 Program Code Analysis

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Program Code Analysis	0	8	4	14	6	32
Response Percentage	0%	25%	12.5%	43.75%	18.75%	100%

Table 4.26 conveys that 0/32 (0%) strongly disagree, 8/32 (25%) disagree, 4/32 (12.5%) are neutral, 14/32 (43.75%) agree and 6/32 (18.75%) strongly agree that the firm should implement Program Code Analysis. Comprehensively, 8/32 (25%) disagree, 4/32 (12.5%) are neutral and 20/32 (62.5%) agree.

Using mode, the researcher deduced that the firm needs to implement Program Code Analysis since many respondents agreed that it should be implemented. The results obtained above are supported by Adrain (2017) who highlighted that this tool, reduces audit costs and time wasted waiting for an expert when the auditors want to audit programmed routines of a client thus this tool is very efficient and effective.

Evolving Techniques

The question was planned to assess if the firm needs to implement evolving techniques as another data analytical tool which will assist in improving audit efficiency. Findings obtained are presented in the table below.

Table 4. 28 Evolving Techniques

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Evolving Techniques	1	2	2	14	13	32
Response Percentage	3.13%	6.25%	6.25%	43.75%	40.62%	100%

Table 4.27 outlines that 1/32 (3.13%) strongly disagree, 2/32 (6.25%) disagree, 2/32 (6.25%) are neutral, 14/32 (43.75%) agree and 13/32 (40.62%) strongly agree. In total 3/32 (9.37%) disagree, 2/32 (6.25%) are neutral and 27/32 (84.37%) agree.

According to results above many respondents fall under the modal class which was agreeing that the firm needs to implement evolving techniques. This is because the system is very efficient and it does not allow manipulation of data moreover, auditors are aware of the benefits of the tool. Results obtained above are supported by Michael and Uday (2018) who suggest that with this tool auditors can work with data which is not manipulated thus improving the quality of the audit report. In support again, Gartner (2013) highlighted that assist in improving audit efficiency as auditors can easily extract data from client's computers hence time which is wasted when auditors wait for requested data is eliminated. Considering the results obtained from questionnaires and arguments by scholars the researcher deduced that the firm needs to implement evolving techniques.

Audit Retrieval Software

The question intended to verify if the firm needs to implement Audit Retrieval Software as another data analytical tool. Findings which were obtained are tabled below.

Table 4. 29 Audit Retrieval Software

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Audit Retrieval Software	1	4	1	11	15	32
Response Percentage	3.13%	12.5%	3.13%	34.37%	46.87%	100%

Table 4.28 indicates that 1/32 (3.13%) strongly disagree, 4/32 (12.5%) disagree, 1/32 (3.13%) neutral, 11/32 (34.37%) agree and 15/32 (46.87%) strongly agree that the firm needs to implement Audit Retrieval Software as another data analytical tool. Combined 5/32 (15.63%) disagree, 1/32 (3.13%) neutral and 26/32 (81.25%) agree.

Using mode, the researcher denoted that respondents agree that the firm needs to implement Audit Retrieval Software since many respondents were in the modal class which agreed. Many respondents agreed because auditors are aware of the tool because the firm is partly using for sampling only but auditors want to use all the functions of the tool as it will really improve audit efficiency and audit quality. This is supported by Mahzan and Lymer (2014) who highlighted that big four audit firms have partially implemented the tool as they only use the sampling and generation of reports application. Jackson and Stent (2014) also support the above results as they alluded that this tool improves efficiency and effectiveness as most work will be automated.

INTERVIEW RESPONSES

Interview responses transcribed

Table 4. 30 Transcribed Interview Response

	Interview Question	Interviewee 1	Interviewee 2	Interviewee 3
1	1. Do you think evolution of big data by clients is the main reason why auditors are bursting audit costs and time budgets?	From my own observation, I think it's because of evolution of big data because it is difficult to work with, as our firm 'KPMG' has not yet fully implemented tools which are compatible with big data	Yes, because big data is difficult to work with.	In deed it is because of big data because the firm has managed to work very well on other issues which were suspected before like team composition, work overload, incompetence's just to mention a few
2	What do you think is the impact of application of data analytics on audit efficiency?	I think use or adoption of data analytics has a positive impact because with data analytics a lot of processes will be automated thus improving the rate of doing working.	Data analytics have a positive impact on audit efficiency since its use improve audit efficiency.	There is a positive impact between the two variables, though I think data analytics mainly impact audit quality.

3	Have there been any changes on audit efficiency from the time the firm partially implemented data analytics in carrying out audit?	Very huge change, though that time the rate of evolution of big data was very low, but from the time clients were now developing on big data the efficiency has been declining because the firm has not fully implemented data analytics.	I cannot say there was much change since other factors that affect audit efficiency were not held at constant	There was a positive change because soon after implementation the rating of bursting budgets was significantly reduced, however due to evolution of big data, budgets began to burst again.
4	Do you think challenges encountered when using data analytics might be a barrier on audit efficiency?	Yes, they might be a barrier on audit efficiency, but everything in the universe has its own drawbacks, however challenges can be addressed so in other words I can say the challenges have no impact.	Yes, challenges affect audit efficiency negatively and might even worsen the time and cost budgets to burst more.	Challenges encountered when using data analytics cause audit efficiency to decline very much however if there are counter measures challenges will not have an impact.
5	What measures have you put in place to address challenges that are faced when using data analytics?	The firm has introduced frequent trainings known as 'take up dates' where auditors will be taught new things in the audit environment.	The firm has been constantly recruiting more IT Specialists who assist auditors to audit	The firm has also introduced a policy whereby auditors need to encrypt and frequently change passwords on their machines. The firm has also introduced online trainings which must be completed within a specified deadline and failure to do so might affect promotions.

		programmed systems	
6	Why is it that the firm has not yet fully adopted data analytics in its audit processes?	Fully implementing data analytics is very expensive off which the firm was not assured what will happen next if they wholly invest in expensive data analytics and it does not work out. I have used the word 'was' because since people like you are adding information to the board the firm is working on fully implementing data analytics since the firm will be aware of the effects.	I think the best person to answer that will be the partnership, however I can only say data analytics is still a new area which needs more knowledge so that the firm can be assured of the moves it takes. The firm has not yet fully implemented data analytics because data analytics is still a new area and you know that investing in a new area is risky if you don't have adequate information about that area. I have used the term 'implemented not adopted' because the firm has adopted data analytics but not yet fully implemented them.

7	Do you think the firm should fully implement the use of data analytics in order to improve audit efficiency?	Yes, the firm needs to fully implement the use of data analytics, because data analytics improve audit efficiency significantly. In fact, the firm is working on that issue because it has also noticed the same problems you identified.	Yes, there is need to fully implement the use of data analytics because the world is becoming more digital each year and big data is evolving and growing each year.	Definitely yes.
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Discussion of Interview responses

Interview Question 1

This question was meant to verify if evolution of big data by clients really contributed to the problem statement of the study. Responses are transcribed in table 4.29(above).

From interviews which were held and the responses transcribed in table 4.29, the researcher noted that all the three interviewees agreed that the main reason which contributed to auditors bursting costs budgets and time set is evolution of big data by clients which is difficult to work with, especially without data analytical tools. The responses obtained from interviews are supported by Vanbutsele (2017), who highlighted that data analytics is the future of the auditing profession

considering big data produced by clients. it is important to come up with data analytics which might improve audit efficiency. Basing on the responses which were given in interviews and arguments by scholars, the researcher noted that evolution of big data is really the main reason why auditors are bursting time and costs budget.

Interview Question 2

The researcher noted that all the three interviewees suggested that data analytics have a positive impact on audit efficiency as shown in table 4.29. Responses which were given by interviewees which agreed with the responses which were obtained from questionnaires were 66% of the respondents, and suggested that data analytics have a positive impact on audit efficiency. Alles (2021) and Gepp et al. (2018) support the fact shown by the results obtained from questionnaires and interviews, that there is a positive impact on audit efficiency as Alles (2015) alluded that audit firms should keep on investing in data analytics as they have a positive impact on audit efficiency. Furthermore, Chan et al. (2018) also support results obtained above as Chan et al, (2018) state that automation and use of technology in carrying out audit assignments enhances audit efficiency.

Interview Question 3

This question was designed to verify if data analytics really has an impact on audit efficiency. From responses delineated in table 4.29, two of the interviewees highlighted that adoption of data analytics improved audit efficiency therefore these responses address the main objective of the study which was to determine the effect of adoption of data analytics on audit efficiency. This made the researcher deduce that adoption of data analytics has a positive effect on audit efficiency. This notion is also supported by Alles (2015), Ramlukan (2015) and many other scholars who were reviewed in chapter two of the author's research.

Interview Question 4

From table 4.29 it can be noted that all the interviewees suggested that challenges encountered when using data analytics have negative effect on audit efficiency. This is supported by ICAS (2017) report which states that challenges encountered when using data analytics might actually affect audit efficiency negatively. Alles (2015) also supports the fact that challenges encountered when using data analytics decreases audit efficiency as Alles (2015) states that when there are system breakdowns, auditors will spend more time auditing as they will have to wait for specialists. Interviewee number two even mentioned that challenges encountered might even worsen the audit efficiency, to decline very significantly. However, the other two interviewees mentioned that challenges might affect audit efficiency negatively but if these challenges are addressed audit efficiency will not decline.

Interview Question 5

Table 4.29 shows responses which were given by interviewees with regards to question five and it can be noted that all interviewees suggested solutions which were mentioned by other scholars who were reviewed in chapter two. The first interviewee mentioned about trainings which is supported by the respondents from the questionnaires where 96.78% of the respondents agreed that training is a solution to challenges encountered. Responses obtained from the interviews is also supported by Earley (2015) who suggests that audit firms must train their auditors.

Interview Question 6

Table 4.29 highlights responses which were given by interviewees with regards to this question. It can be noted that all of the interviewees were of the perspective that data analytics is still a new area which needs more research so that the firm can be assured of fully implementing data

analytics. This is supported by Bender (2017) who clearly stated that, firms have not yet fully adopted data analytics because they do not know what the future holds for them.

Interview Question 7

This question was designed so as to assist the researcher in giving recommendations to KPMG. From responses which were given by interviewees, it can be shown that all of the interviewees agreed that there is need for the firm to fully implement data analytics because the auditing industry is heading towards a dynamic world. This is supported by EY and Harris (2017) who state that adoption of data analytics is very important as many clients are now producing big data. Alles (2015) also highlighted the fact that audit firms need to invest in data analytics for them to remain competitive. Interview number three even mentioned that the firm is working on adopting an in-house data analytical tool. This is also supported by 84% of the respondents on the questionnaire who also agreed that the firm needs to fully implement data analytics.

Chapter Summary

This chapter looked at the introduction of the chapter, data presentation and analysis and finally a discussion and interpretation. Data which was presented and analyzed was collected through questionnaires and through conduction of interviews. Response rate both for questionnaires and interviews was assessed. Data collected through interviews was presented using tables, graphs and pie charts. Data obtained through questionnaires was analyzed using descriptive statistics measures of central tendency (mode) and measures of frequency (percent). Qualitative coding and analysis were used to analyze qualitative data from interviews. The next chapter will be on chapter summaries, conclusions and recommendations.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECCOMENDATIONS

5.1: Introduction

The previous chapter covered presentation and analysis of data which was collected using the research methods in chapter three. This chapter will delineate the summary of the study by looking at conclusions, discussions, implications and recommendations. Lastly the chapter will look at suggestions for further research.

5.2: Discussion

The objective of the study was to evaluate the effect of adoption of data analytics on audit efficiency. Its core focus in this study was KPMG Zimbabwe. The main reason why auditors at KPMG spent more than the budgeted time and blew budgets at clients is because of the evolution of big data by clients as this was confirmed by all the interviewees. Other findings from the study were that, time spent auditing and audit costs are the main variables of audit efficiency as shown through responses obtained from questionnaires. This study also discovered that adoption or use of data analytics has a positive effect on audit efficiency as this was confirmed by all the interviewees and many respondents of the questionnaires. The results obtained from the field were also supported by some of the scholars who were reviewed in chapter two.

The study revealed that data analytics do not only improve audit efficiency but also improve audit quality, audit effectiveness and client service. This was again supported by the respondents of the questionnaires. Through the questionnaires it was discovered in this study that auditors face the following challenges when using data analytics, namely; data availability, system breakdown, expertise of auditors, theft of data and incompatibility of hardware. The study also revealed that there are solutions which can address the challenges encountered when using data analytics. Of

the solutions which were discovered education and training were discovered to be the main solution. It was found through this study that KPMG needs to fully implement and adopt data analytics in order to improve audit efficiency. It was also discovered that KPMG needs to adopt other data analytical tools in order to improve audit efficiency.

5.3: Conclusions

The main objective of this study was to determine the effect of adoption of data analytics on audit efficiency. It was noted through this study that adoption of data analytics has a positive effect on audit efficiency, as noted through the responses on all the questionnaires and responses from all the interviewees. The results obtained from questionnaires and interviews were also supported by some of the scholars reviewed in chapter two such as Ramlukan (2015), Earley (2015) and Alles (2015) who emphasized on the need for audit firms to fully adopt data analytics as data analytics have an impact on audit efficiency. The researcher managed to address the objectives of the study and was able to come up with conclusions, thus the research was deemed to be a success as it also managed to address the problems which were identified at KPMG.

5.4: Implications

The findings in this study have brought about an understanding that, it is very important to adopt data analytics, as this will enable auditors to finish audit tasks, earlier than before. This study was also relevant in exploring the different data analytics tools that can be implemented by firms, or KPMG in particular. These findings were mainly relevant for the audit department in audit firms, as they can help them in maintaining and strengthening their client-firm relationships. Full implementation of data analytics will only result in intelligent designing of policies by policy makers. Implementation of effective data analytics tools will increase the trust in the end result,

that clients have when being audited by an audit firm, as these are scientifically proven to be a hundred percent effective.

5.5: Recommendations

- KPMG should fully implement the use of data analytics so as to improve audit efficiency, thus auditors will no longer be bursting, budgeted audit time and costs. This will improve the relationship between the firm and clients hence, chances of losing clients due to missing of deadlines will be reduced.
- Auditors are recommended to try to meet deadlines and reduce audit costs, so as to improve audit efficiency as it was discovered in this study that audit hours and costs are the main variables of audit efficiency.
- KPMG should continue educating and training its auditors with regards to data analytics so that auditors will not face challenges when using data analytics.
- KPMG should recruit more Information Technology specialists that have some knowledge in auditing, who will assist auditors to use data analytical tools and help auditors to audit some client programmed systems using data analytics.
- KPMG is recommended to implement the following data analytical tools as they have a positive effect on audit efficiency and great impact on auditing; Program Code Analysis, Evolving Techniques, Audit Retrieval Software and Embedded Audit Routines.

5.6 Suggestions for further research

Data analytics is still a new area in auditing which still needs more research. An analysis on the application of data analytics on all the stages of auditing can be suggested as an area of further study.

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APPENDIX 1

Request Letter

Africa University

1 Fairfield Road,

Off Nyanga Road

PO BOX 1320

Mutare

10/02/2022

The Human Resources Manager

KPMG

100 The Chase West

Emerald Hill

Harare

Dear Sir/Madam

RE: Request to carry out a research with KPMG external audit department.

My name is Ruvimbo Wushe, a final year student at Africa University, in pursuit of an Honors Degree in Accounting. In partial fulfilment of my degree I am required to carry out a research and my research topic is **“The effects of adoption of data analytics on audit efficiency.”**

I wish to distribute questionnaires and conduct interviews in the external audit department. The information provided will be treated with confidentiality and is limited for academic purposes only.

Yours sincerely

Ruvimbo Wushe

APPENDIX II

Questionnaire

Dear Respondent

My name is Ruvimbo Wushe, a final year student at Africa University, undertaking an Honors Degree in Accounting. I am doing a research on “The effects of adoption of data analytics on audit efficiency.”

As part of my research I have designed questionnaires to obtain information from different participants in the external audit department. Your contribution will be greatly appreciated and feel free to contribute, as your contributions will be regarded as highly confidential and limited for academic purposes only.

Instructions

1. Answer **ALL** questions
2. Highlight your response by ticking the respective answer box or complete in the spaces provided.
3. Do **NOT** write your name on the questionnaire.

QUESTIONS

1a. Gender:

Male

☐

Female

☐

b. Position:

Audit Partner	Audit Manager	Audit Supervisor	Audit Senior	Audit Associate
☐	☐	☐	☐	☐

c. Professional Qualifications:

First Degree	CTA	ITC	CA(Z)	Other
☐	☐	☐	☐	☐

For other specify.....

d. Working experience:

0 to 3years	4 to 7 years	7 to 10 years	Above 10 years

2a. the following are variables for audit efficiency:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Time spent on an audit					
Costs of the audit					
Audit fee					

2b. what is the impact of data analytics on audit efficiency?

Positive Negative No impact

2c. Do you think the firm needs to fully implement data analytics?

Yes No

3. Importance of Data Analytics in audit:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Improves audit efficiency					
Improves audit effectiveness					
Improves client service					
Enhances audit quality					
Closes the expectation gap					

4a. Auditors face some challenges when using Data Analytics in auditing, do you agree with the challenges listed below?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Expertise of auditors					
Data availability. Integrity and Relevance					
Theft of data or data confidentiality					
System breakdown					

Compatibility of hardware					
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4b. below are suggested solutions to address the challenges encountered when using Data Analytics:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Training and Education knowledge for auditors					
Auditors` access to data					
Backup					
Data encryption					
Recruitment of Information Technology department					

5. Do you agree that the firm needs to implement the following Data Analytical tools in order to improve audit efficiency?

Data Analytical tools	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Systems Control Audit Review Function					
Integrated Test Facility					
Snapshots					
Programmed Code Analysis					
Evolving Techniques					
Audit Retrieval Software					

THIS IS THE END OF THE QUESTIONNAIRE. THANK YOU FOR YOUR CONTRIBUTION.

APPENDIX III INTERVIEW GUIDE

Interview Questions

1. Do you think evolution of big data by clients is the main reason why auditors are bursting audit cost and time budgets?
2. What do you think is the impact of application of data analytics on audit efficiency?
3. Have there been any changes on audit efficiency from the time the firm partially implemented data analytics in carrying out audit?
4. Do you think challenges encountered when using data analytics might be a barrier on audit efficiency of the firm?
5. What measures have you put in place to address challenges that are faced when using data analytics?
6. Why is it that the firm has not yet fully adopted data analytics in its audit processes?
7. Do you think the firm should fully implement the use of data analytics in order to improve audit efficiency?

THANK YOU FOR YOUR CONTRIBUTION

APPENDIX IV: AUREC APPROVAL LETTER



AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 website: www.africau.edu

Ref: AU2751/23

12 April, 2023

RUVIMBO WUSHE
C/O Africa University
Box 1320
MUTARE

RE: **THE EFFECT OF ADOPTION OF DATA ANALYTICS ON AUDIT EFFICIENCY**

Thank you for the above-titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

- a) Research proposal
 - **APPROVAL NUMBER** AUREC 2751/23
This number should be used on all correspondences, consent forms, and appropriate documents.
 - **AUREC MEETING DATE** NA
 - **APPROVAL DATE** April 12, 2023
 - **EXPIRATION DATE** April 12, 2024
 - **TYPE OF MEETING** Expedited
- After the expiration date, this research may only continue upon renewal. For purposes of renewal, a progress report on a standard AUREC form should be submitted a month before the expiration date.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.



Yours Faithfully

MARY CHINZOU
ASSISTANT RESEARCH OFFICER: FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

APPENDIX V: REQUEST FOR PERMISSION LETTER

Africa University

1 Fairview Road Off Nyanga Road,

PO BOX 1320

9 February 2023

KPMG

100 The Chase West

Mutual Gardens

Harare

Dear Sir/ Madam

RE: REQUEST FOR PERMISSION TO CONDUCT A CASE STUDY ON KPMG ZIMBABWE

My name is Ruvimbo Wushe, registration number 190421. I am an undergraduate student (LEVEL 4.2), currently studying towards achieving my Bachelor of Accountancy (Honours) degree with the College of Business, Peace, Leadership and Governance at Africa University. I am also a former KPMG attaché (2022).

As part of the Undergraduate academic curriculum, I am required to undertake a dissertation in fulfilment of my qualification for the Bachelor of Science (Honours) Degree in Accountancy. I wish to undertake a study entitled: **THE EFFECTS OF ADOPTION OF DATA ANALYTICS ON AUDIT EFFICIENCY. A case of KPMG ZIMBABWE.**

I therefore seek permission from your office to conduct the research at KPMG, so as to obtain information in relation to the topic to be investigated. The data gathered will be purely utilized for research and academic purposes.

All necessary ethical considerations will be enhanced to protect the welfare and dignity of the participants.

Yours sincerely

Ruvimbo Wushe

+263 778206245

wusher@afriau.edu